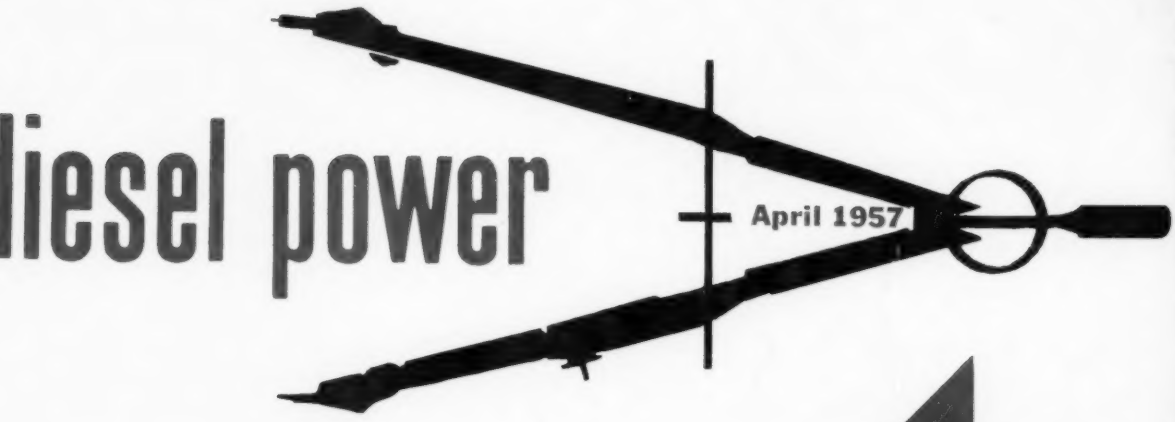
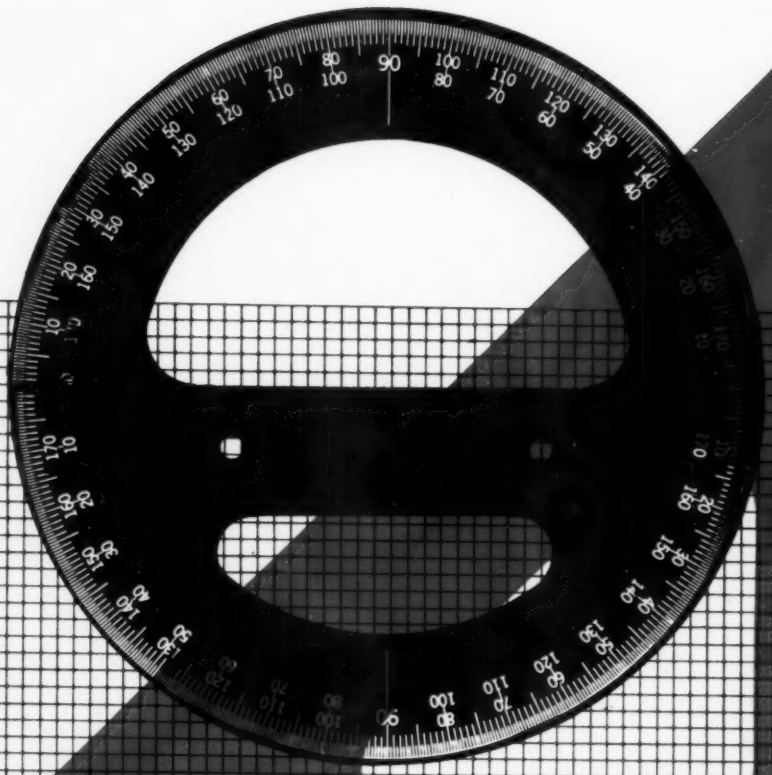
diesel power

April 1957





ENGINE SPECIFICATIONS

behind these generators...

WELL-LUBRICATED POWER

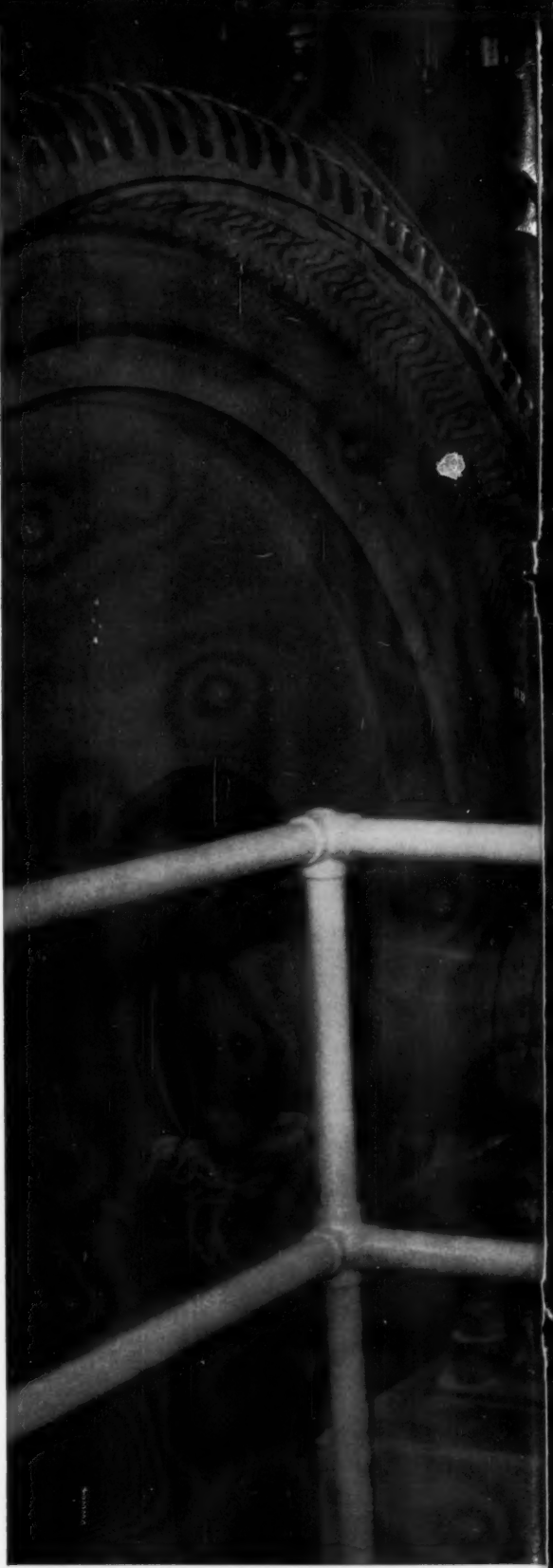
The powerful drive of today's modern engines depends upon the smooth functioning of every part. *Texaco Ursa Oils* help diesel, gas, and dual-fuel engines deliver their full rated power year after year by guarding against harmful deposits and keeping rings and valves free. This means full compression and complete combustion. Power output stays high, fuel consumption and maintenance costs stay down.

Texaco Ursa Oils—a full line to meet every need—are especially refined to assure *more power* with *less fuel* and *longer periods* between overhauls.

- **For over 20 years, more stationary diesel horsepower in the U.S. has been lubricated with Texaco than with any other brand.**

Your Texaco Lubrication Engineer offers his years of experience in helping you select the right Texaco Lubricant for your needs. You can contact him by calling the nearest of the more than 2,000 Texaco Distributing Plants, or by writing:

The Texas Company, 135 East 42nd Street, New York 17, N.Y.



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every Saturday afternoon

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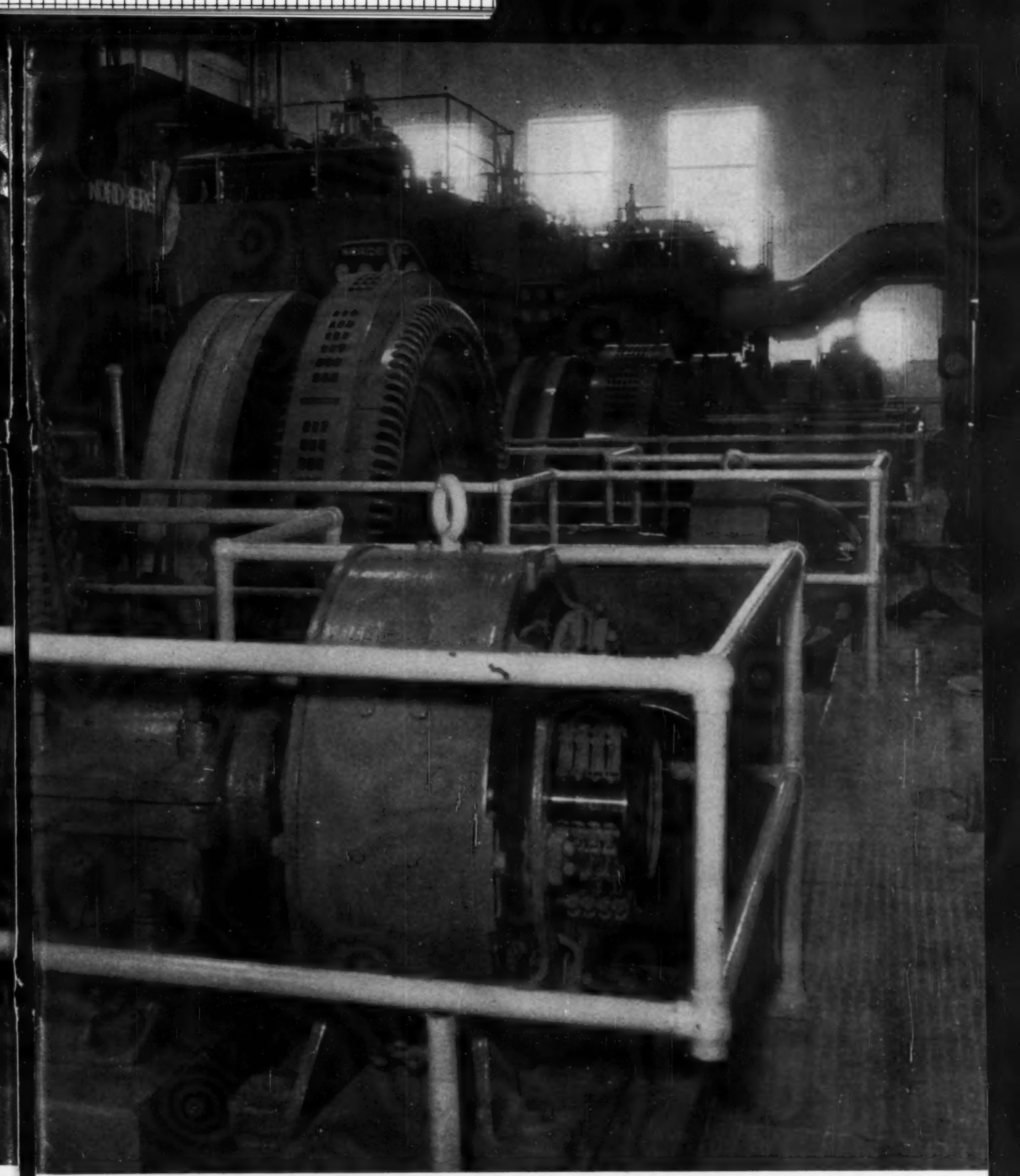

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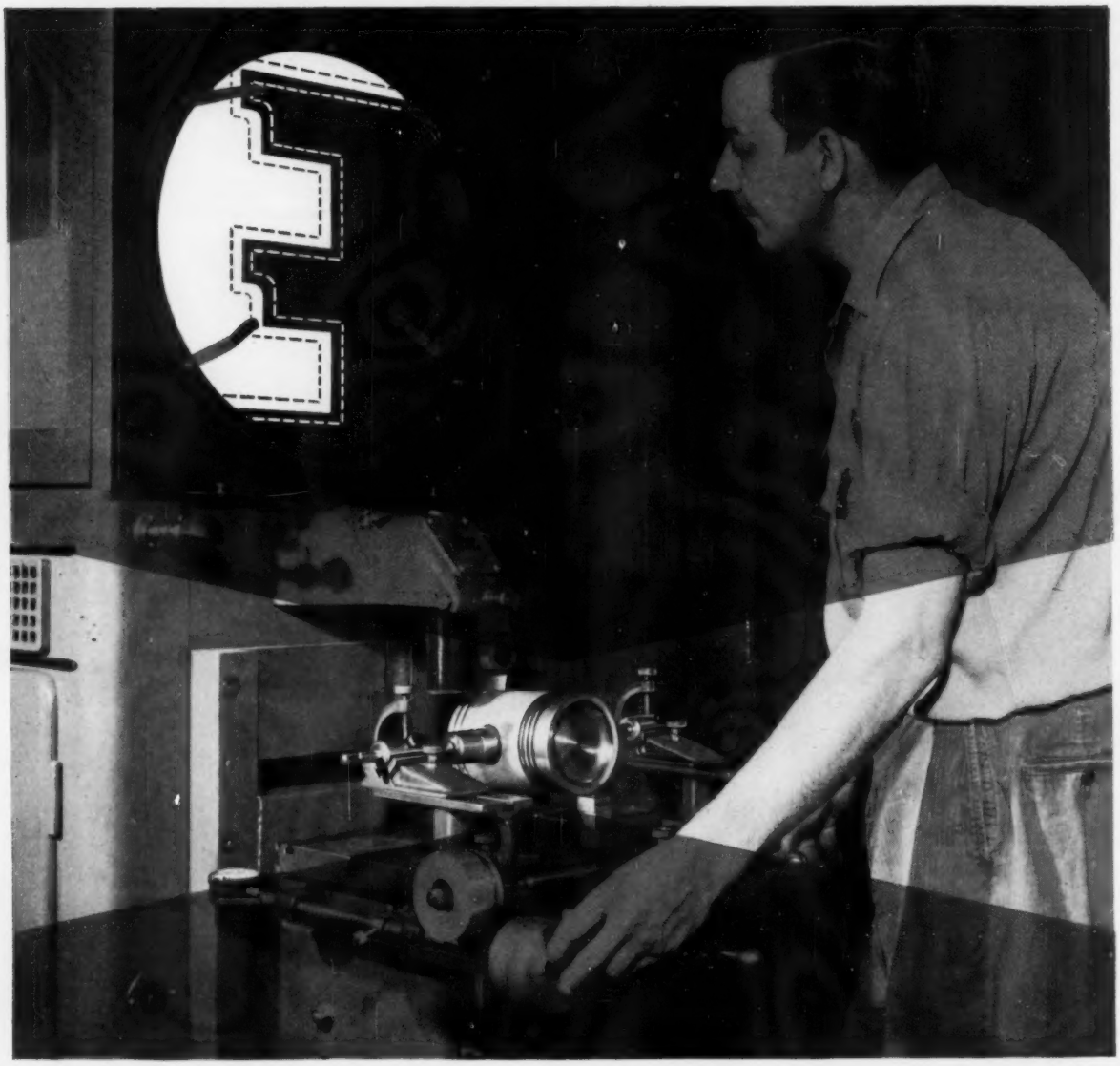
FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

GM DETROIT DIESEL PARTS

—factory-engineered for long life, low-cost service



SHADOWGRAPH CHECKING is one of the precision tests that assure highest quality of factory-engineered GM Detroit Diesel original and replacement parts. In this photo, a magnified piston ring groove is compared with a perfect standard graph. This precision control is important to piston lubrication.

Scientific packaging of GM Detroit Diesel parts assures protection both in shipment and storage.

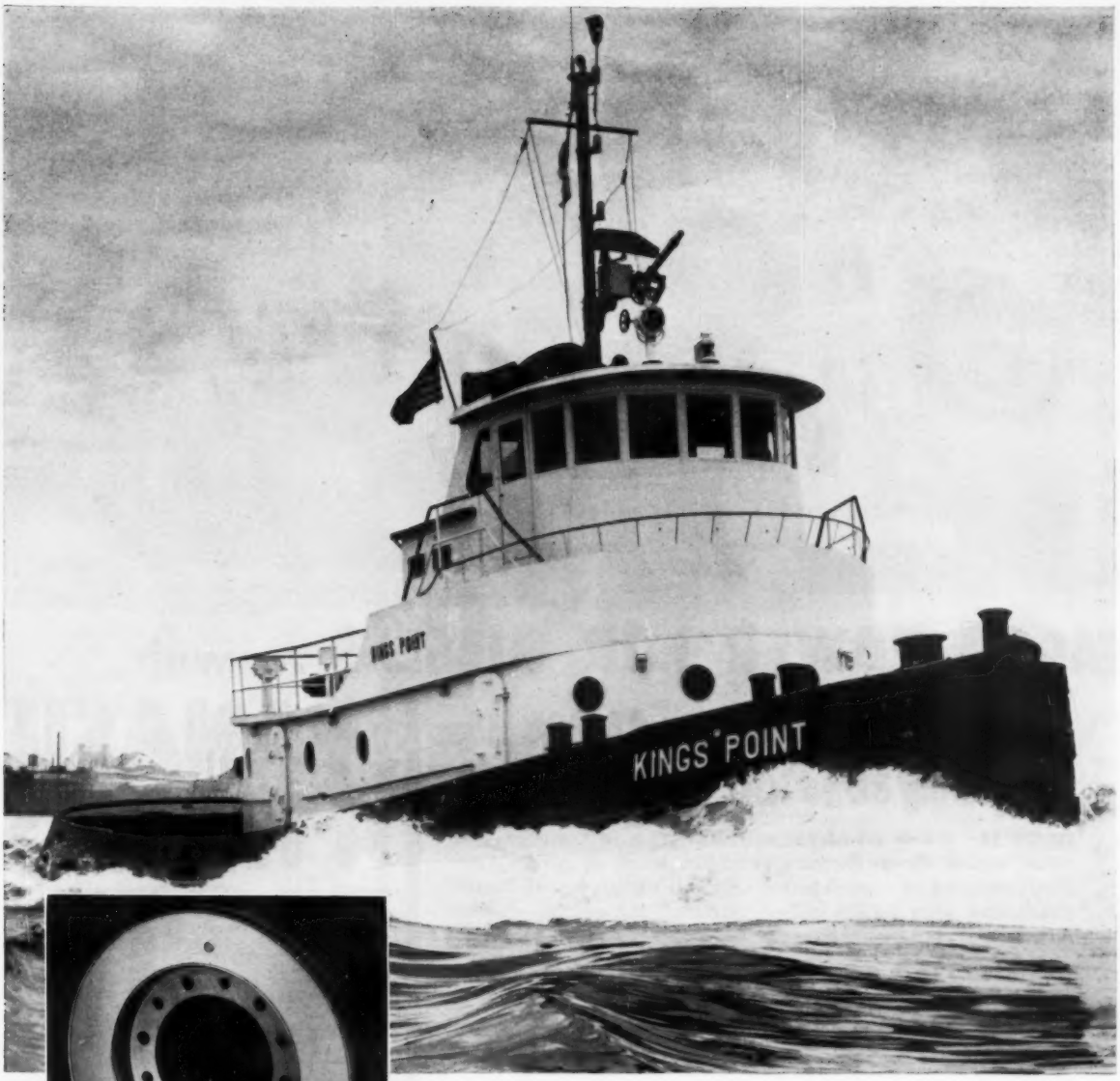
You're always money ahead when you buy factory-engineered GM Detroit Diesel parts from your Distributor or Dealer

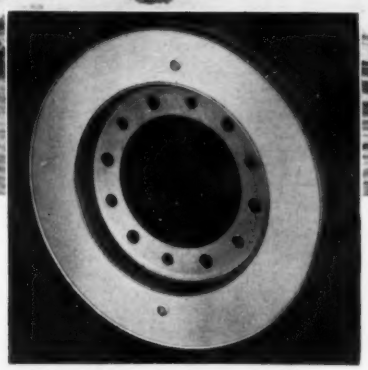
GM DETROIT DIESEL POWER

DETROIT DIESEL

Engine Division of General Motors • Detroit 28, Michigan

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario





POWER PROTECTED...

with a Houdaille Vibration Damper

Torsional Vibration Dampers . . .

are part of Houdaille's complete line of special-design hydraulic products for the marine, railroad, aircraft and general industrial fields. Experienced engineers are at your service for any application involving hydraulics. Write for additional information or specification sheets.

The 2100 hp. ALCO 251 diesel which makes the *Kings Point* the most powerful harbor tug in the United States, is equipped with a Houdaille Torsional Vibration Damper on the engine crankshaft.

Houdaille's exclusive design, utilizing the shearing action of the highly viscous fluid, permits the building of diesel engines with increased horsepower. Because the Houdaille damper is *untuned*, it is equally effective across the full range of engine criticals.

HOUDAILLE INDUSTRIES, INC.

BUFFALO HYDRAULICS DIVISION

537 East Delavan Avenue • Buffalo 11, New York

MORE POWER FOR DIESELS... with VANASIL PISTONS

"Vanasil Pistons Perfect after 86,226 Miles — Hauling 80 to 100 Ton Payloads"

TRUCK 23—A new set of Vanasil Pistons put in Cummins 300 diesel engine. Power increase permitted using ½ gear higher. Fuel consumption—much better. Oil consumption—good. Motor overhauled after 86,226 miles—"miking" the pistons showed *no wear* and *ring grooves were perfect.*

TRUCK 18 (in photo above)—Has rebuilt Cummins engine from truck 23, with *same Vanasil pistons* and new set of sleeves and rings. Now has several thousand more miles, hauling 80 to 100 ton loads of logs on private roads. This is a Cummins 300 in a Kenworth truck.

OPERATOR'S COMMENTS:

- **Smooth, quiet motor. If you walk away 15 feet, turn your back, you cannot tell if it's a diesel or gas engine running.**
- **Acceleration better for changing gears—more power for steep grades.**
- **Can make better time than other trucks. Truck 23, hauling heaviest load permitted by California laws, regularly saved from ½ hr. to 1 hr. on 115-120 mile run from loading point to Bay area.**
- **Drivers like to drive this "Vanasil" truck.**

(CAREFUL COST RECORDS are kept by this operator of 26 diesel powered trucks which handle 300,000 feet of logs and 60,000 board feet of lumber each working day.)

TRY VANASIL PISTONS!

You'll handle bigger payloads faster. You'll cut down on fuel and oil costs. You'll get long, l-o-n-g, L-O-N-G piston wear and fewer overhauls. Write or phone for circular—let us quote you on Vanasil pistons.

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COLORADO—
Denver Bearing Co., 780 Lincoln St., Denver 2

NEW YORK—
Bethlehem Equipment Co., 109 W. 64th St., New York 23

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diesel power

Established in 1923 **Vol. 35, No. 4** **April, 1957**

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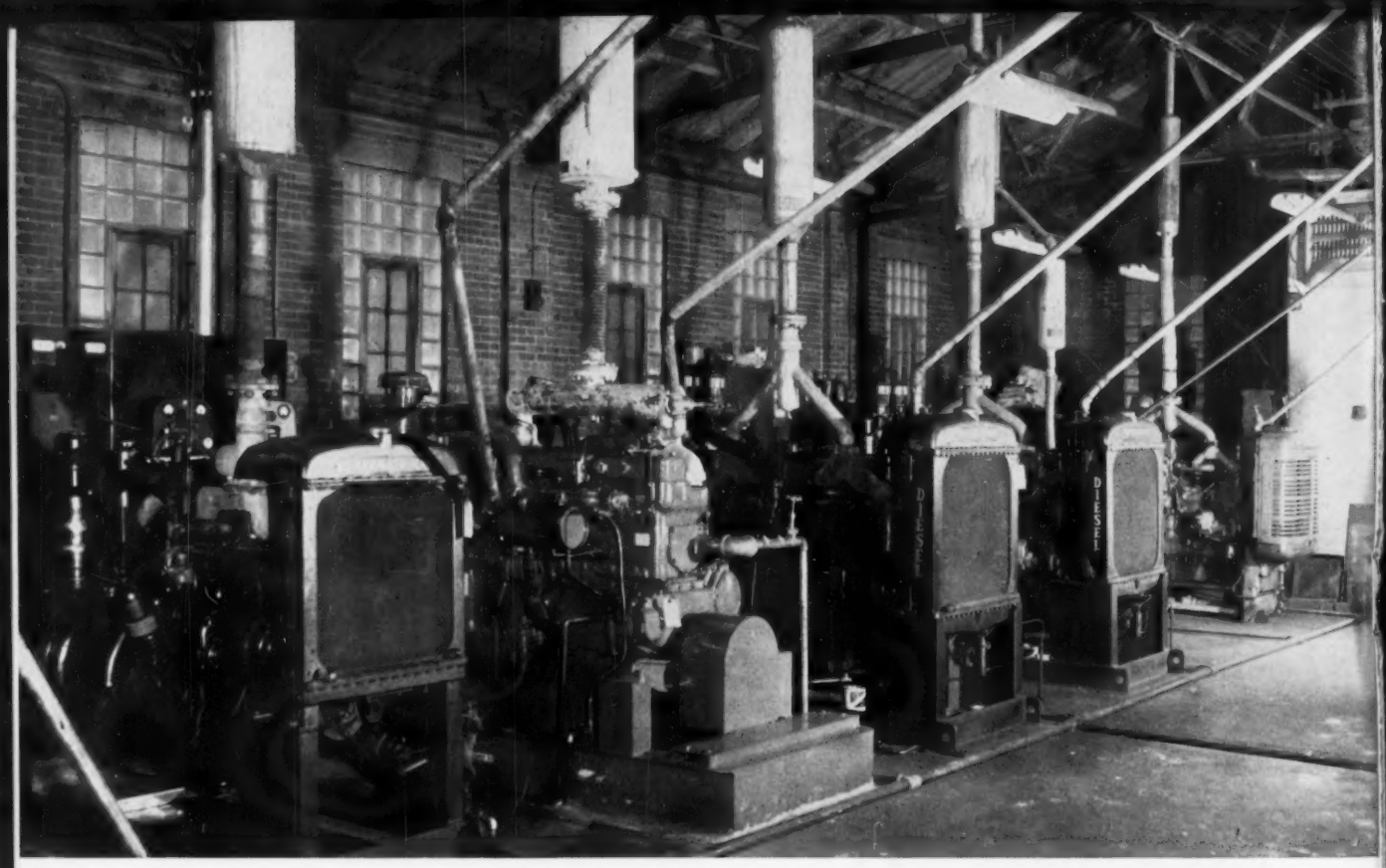

Here are five of eight International diesels that have driven Ready-Power generators in Standard Carbon's powerhouse for a total of 107 engine service-years. The UD-1091, second from left, is seven months old. The other 7 power units average over 15 years each of dependable service.

8 Ready-Power International driven GENERATORS CUT ELECTRIC COSTS 43%

Standard Carbon's International power units going strong after 107 service-years

The Standard Carbon Co., Steubenville, Ohio, is a nationally famous manufacturer of carbon brushes.

President W. F. Rogers fills in these details of their powerhouse operation: "We started in business in 1928 operating on purchased power. Back in 1939 we set up our own powerhouse—starting with an International PD-80 diesel power unit on a 48KW Ready-Power generator. Shortly thereafter we bought two more of these units. Today our eight Ready-Power generators are all driven by Internationals—*and we are generating power for 43% less than we pay for the 15% of the electricity we still purchase.*"

Supt. George Rogers adds: "Good service with only minor repairs sums up our experience with Internationals. Our Internationals have totalled 107 service-years—an average of over 13 years per engine. And only recently I rebuilt one of the 17-year-olds for the first time and still was able to reuse many of the original parts including the crankshaft!"

You, too, can get this same kind of completely dependable, low-cost power for your generator sets...or any driven machine in your pit or quarry. Simply call your easy-to-locate International Power Unit Distributor or Dealer. He can make power recommendations that are right for your needs. Equally important, his service facilities, his parts stock, his desire to be of service will help you get the most out of your engines. Call him soon.

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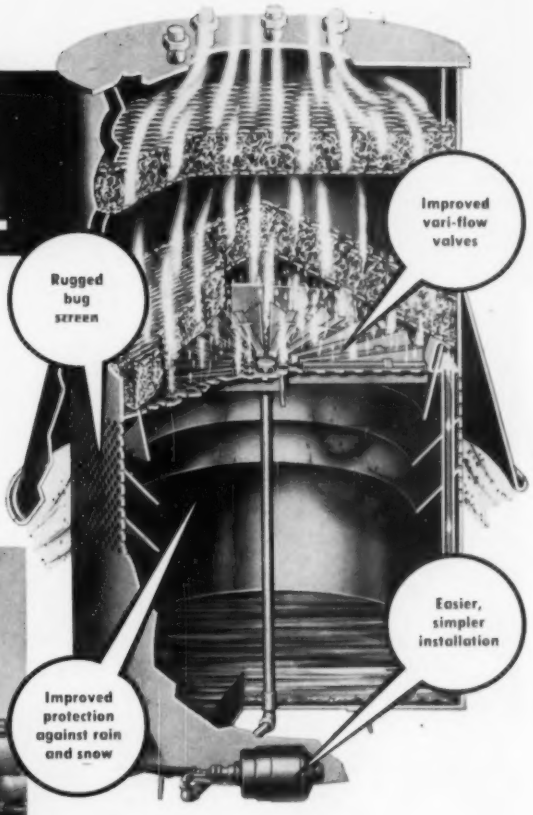
A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks

NOW 4 WAYS BETTER! NEW AAF TYPE P CYCOIL

Complete Dust Protection for Engines and Compressors



AAF Cycoils protect eight 412 KVG compressors at this natural gas pipe line station.

Since their introduction, AAF Type P Cycoil Oil Bath Air Cleaners have proved their dependability in thousands of installations where dust-free air *had* to be provided for super-charged engines and centrifugal compressors. The latest model of this low resistance-high efficiency cleaner offers four improvements:

1 The pump has been mounted at the base, eliminating the legs. The new Type P is easier and less expensive to install.

2 Improved protection against snow and water has been provided at the intake.

3 The expanded metal bug screen formerly used has been replaced by a rugged perforated plate.

4 Vari-flow valves have been redesigned and improved.

The outward appearance of the new Type P Cycoil now harmonizes with existing installations of all types of AAF Cycoils.

Cycoil's have built their reputation in industry because they fight for every particle of dust. Thorough mixing of oil with intake air and positive draining from the filters assures that 100% of the damaging dust is removed.

Would you like to know how Cycoils might solve your dust problem? Write us today for complete Cycoil data.

AAF American Air Filter COMPANY, INC.

445 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Type CMS Multi-Duty Filters

Type G Pipeline Air Filters

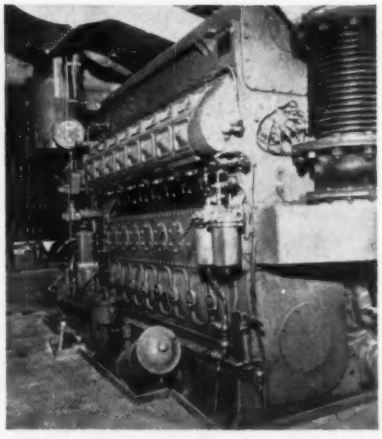
BETTER AIR IS OUR BUSINESS

Type OCH Intake Air Filters

Cycoil Oil Bath Air Filters

Baltimore's fireboat *Mayor Thomas D'Alesandro Jr.* has four O-P's totaling 2640 hp. for propulsion and pumping service.

Newest Fireboat Performance Powered by Fairbanks-Morse Opposed-Piston Diesels



Fire alarms sounding today in Baltimore's expanding harbor area are quickly answered by the newest in fireboat performance. Powered by a pair of 660 hp. Fairbanks-Morse Model 38F 5¼ Opposed-Piston Marine Diesels, this highly maneuverable vessel sails smoothly at full speed, completely without vibration and crash-reverses in less than two lengths.

Another identical pair of O-P's power the two 10" F-M fire pumps that can throw 12,000 g.p.m. at 150 lb. pressure.

Only compact Opposed-Piston power could provide this performance, yet keep weight down for higher top speed.

On a fireboat—on your boat—when the need is for dependable power produced economically, you cannot match the standard set by Opposed-Piston marine diesels from 200 to 2400 horsepower. Fairbanks, Morse & Co., Dept. DIP-4, Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

AiResearch Turbochargers make your diesels run cooler!

Factors like advanced wheel design and perfectly matched turbine and compressor keep engine thermal loading at a minimum

So effective is the AiResearch turbocharger that it provides power gains while actually lowering the heat level of the engine.

Ambient air is compressed with an efficiency as high as 82%, feeding a maximum weight of air into the cylinders at the lowest possible temperature.

Results: maximum power gain at minimum fuel cost; complete combustion with elimination of objectionable smoking; low engine thermal loading insuring long, trouble-free operation.

All AiResearch turbochargers are air cooled, placing no added burden on the diesel cooling system and requiring no complicated plumbing. The rotating assembly is removable as a unit, simplifying in-the-field maintenance. This advanced design evolved from the most extensive experience in the field of small turbomachinery in America.

Your inquiries are invited.

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	F-51	C-60	A-60	E-100	B-100
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

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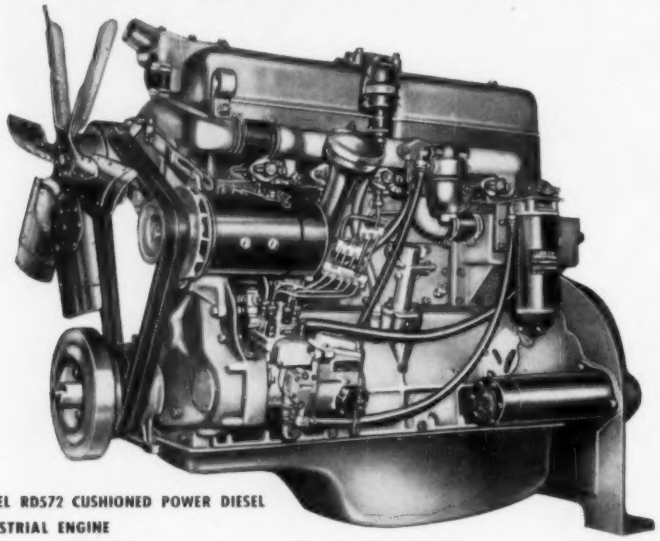
® CUSHIONED POWER DIESELS

34 to 225 HORSEPOWER



MODEL RD572 CUSHIONED POWER DIESEL
INDUSTRIAL ENGINE
154 H. P. @ 2000 R. P. M.

There are three main reasons why Continental's Cushioned Power principle results in higher performance and more efficient operation.

1. **Combustion chamber design assures higher turbulence, promotes cleaner burning. All fuel is utilized.**

•

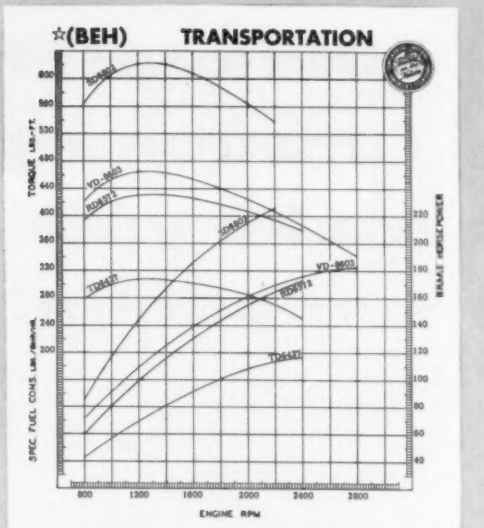
2. **Operation is smoother. Cushioning of the explosive force results in reduction of noise.**

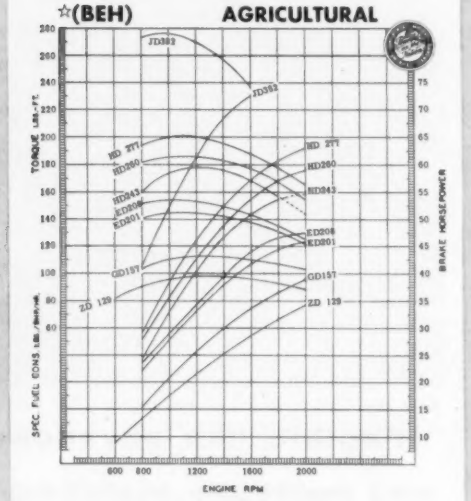
•

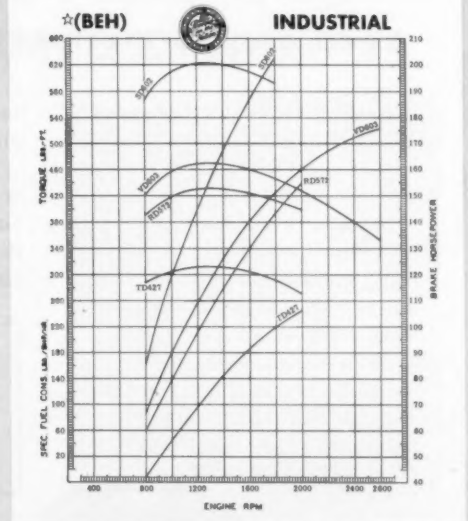
3. **Easing of peak forces on rods, shafts, and bearings makes for longer service, with less time out for repairs. By permitting wide interchangeability of parts with Red Seal® gasoline models, it greatly simplifies the job of service in the field.**

Continental Cushioned Power Diesels are now available for various applications in transportation, agriculture and industry. Write for bulletins and color folder showing how Cushioned Power works.

PARTS AND SERVICE COAST TO COAST







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This Cooper-Bessemer-powered Marion 7400 walking dragline, owned by the Ohio River Collieries Company, is shown stripping overburden from coal deposits near Cheshire, Ohio. The diesel engine is an 8-cylinder Cooper-Bessemer JS, rated 750 hp.

Every month . . .
this COOPER-BESSEMER POWERED DRAGLINE
strips 350,000 yards of overburden

• The Ohio River Collieries Company, operating near Cheshire, Ohio, is now producing 40,000 tons of coal every month. And topping the list of important equipment is a Marion 7400 walking dragline powered by a 750 hp Cooper-Bessemer JS diesel engine.

At work 24 hours a day, 7 days a week, this Cooper-Bessemer powered dragline must strip 35 feet of sandstone and 10 feet of slate to reach valuable coal deposits.

It takes a heavy-duty power plant, with lots of flexibility and stamina, to stand up under conditions like these. Here, to list only a few, are reasons why such a schedule is more routine to a Cooper-Bessemer. There's advanced metallurgy for high strength construction, oversized crankshaft, extra bearing area, precision honed cylinders, tin-plated pistons and unique piston cooling.

Next time *you* need power in the 200 to 5000 hp range . . . mobile, stationary, locomotive, marine . . . get *all* the facts from Cooper-Bessemer.

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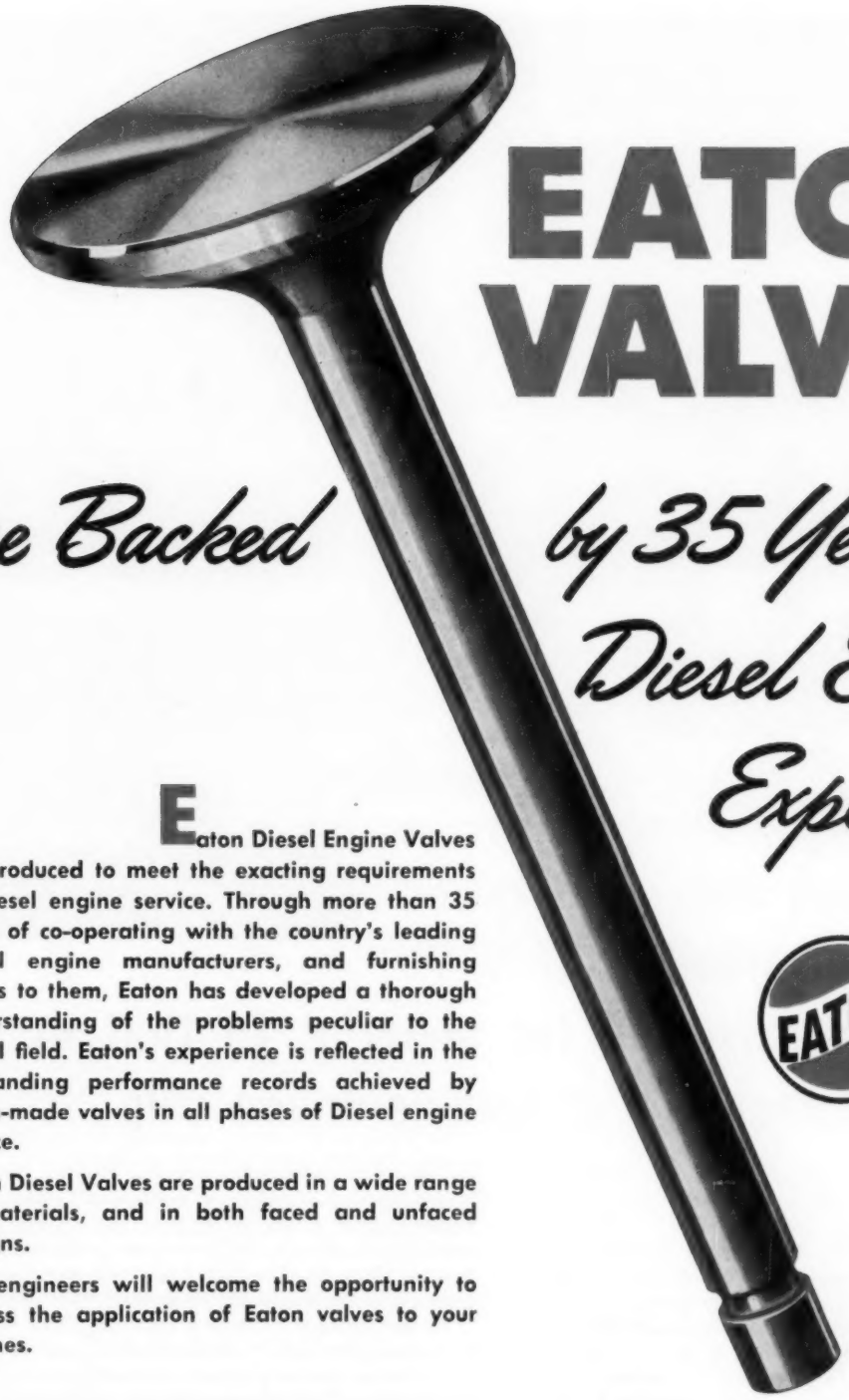

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are Backed by 35 Years of Diesel Engine Experience

Eaton Diesel Engine Valves are produced to meet the exacting requirements of Diesel engine service. Through more than 35 years of co-operating with the country's leading Diesel engine manufacturers, and furnishing valves to them, Eaton has developed a thorough understanding of the problems peculiar to the Diesel field. Eaton's experience is reflected in the outstanding performance records achieved by Eaton-made valves in all phases of Diesel engine service.

Eaton Diesel Valves are produced in a wide range of materials, and in both faced and unfaced designs.

Our engineers will welcome the opportunity to discuss the application of Eaton valves to your engines.

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VALVE DIVISION
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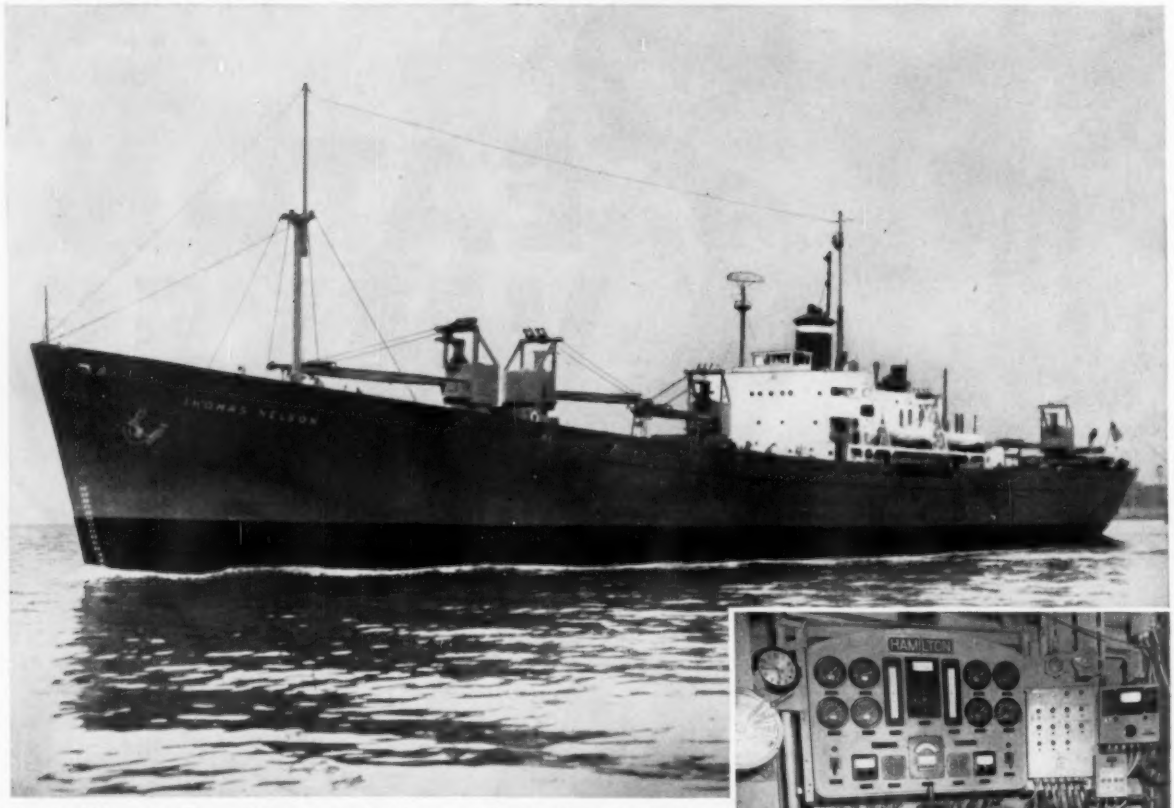
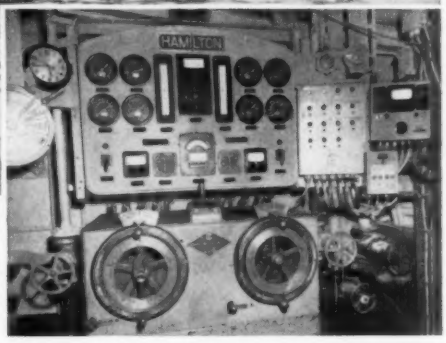


Converted Liberty ship *Thomas Nelson*, equipped with two new Hamilton 7-cylinder diesels.



Compact control panel contributes to quick, sure maneuvering.

"The maneuverability of the *Thomas Nelson* is far superior to that of any steam reciprocating or turbine-driven ship..."

Captain W. J. Taylor voiced this impressive conclusion following the *Thomas Nelson's* maiden voyage from Norfolk, Va., to various points of call in England, France and Holland. The captain also reported that all six foreign pilots who operated the ship in their respective ports praised her handling qualities.

In one instance, while negotiating the Manchester ship canal, another freighter failed to give the *Thomas Nelson* the right-of-way. Only because "propeller rotation changes are practically instantaneous" with the *Thomas Nelson* was it possible to avert the collision that would have been inevitable with a normally equipped Liberty.

Not only are the two Hamilton 7-cylinder engines exceptionally responsive, but the *Thomas Nelson* attained a speed of nearly 18 knots and maintained an average speed of nearly 16 knots during the two ocean crossings. And only .375 pound per brake horsepower-hour of black oil is consumed in these engines. In fuel costs alone, the ship could save $180,000 annually.

We welcome your inquiries regarding these and other Hamilton- and Baldwin-built diesels. There are B-L-H stationary or marine diesels for virtually any installation in the 550 to 7200 hp range which can save you money in fuel and maintenance costs. B-L-H diesels are by far the soundest investment you can make. Write or call today for detailed information.

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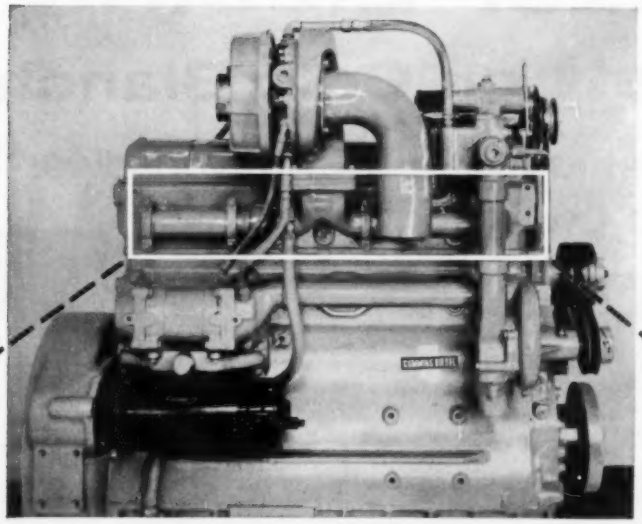
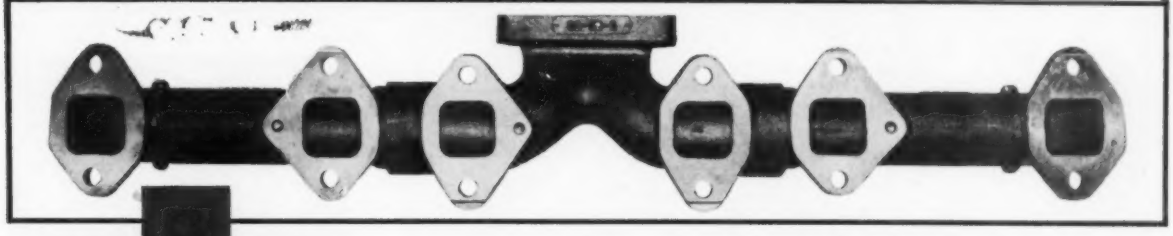
BALDWIN BLH LIMA-HAMILTON



Heat resistance assures prolonged life for the Ni-Resist exhaust manifold on this Cummins automotive JT-6 TURBODIESEL* engine. Ni-Resist exhaust manifolds are installed as original equipment on all TURBODIESEL supercharged engines produced by Cummins Engine Company, Inc., Columbus, Indiana.



CUMMINS ...standardizes on Ni-Resist exhaust manifolds, cuts maintenance of TURBODIESEL engines

Turbocharging of automotive, marine construction and industrial engines increases horsepower substantially. But it also raises exhaust gas temperatures into the range of 1200°F and above.

Exhaust manifolds commonly become red hot especially during long, tough hauls by heavy-duty automotive units. All too soon the heat deteriorates manifolds made of conventional materials.

After testing numerous metals and alloys, Cummins Engine Company, Inc., standardized on Ni-Resist* nickel corrosion-resisting iron for exhaust manifolds of *all* their turbocharged engines. Because this versatile cast material withstands these high temperatures . . . *over long periods.*

Minimizes "between-overhaul" Maintenance

Ordinarily, automotive diesels are overhauled about every 200,000 miles. But burn-outs, cracking and growth of manifolds made from usual materials necessitate replacement during the period between regular overhauls. By contrast, the long life of Ni-Resist manifolds naturally minimizes such extra work and expense.

Ni-Resist manifolds resist oxidation and scaling. If scale does form, it's tight and adherent. This prevents "flake-off" and thus protects turbocharger blades. Moreover Ni-Resist austenitic cast iron resists warping, growth and cracking. Cummins specifies Type 2b Ni-Resist for expansivity matching that of adjacent parts. For the same reason, some manufacturers use Type 3 in similar assemblies.

Resistant to wear as well as heat and corrosion, Ni-Resist manifolds as well as other engine parts can save you money. For further information, fill in this coupon and mail it now.

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

Gentlemen: We'd like more information on Ni-Resist to withstand heat ☐ corrosion ☐ wear ☐

Name_____

Title_____

Company_____

Address_____

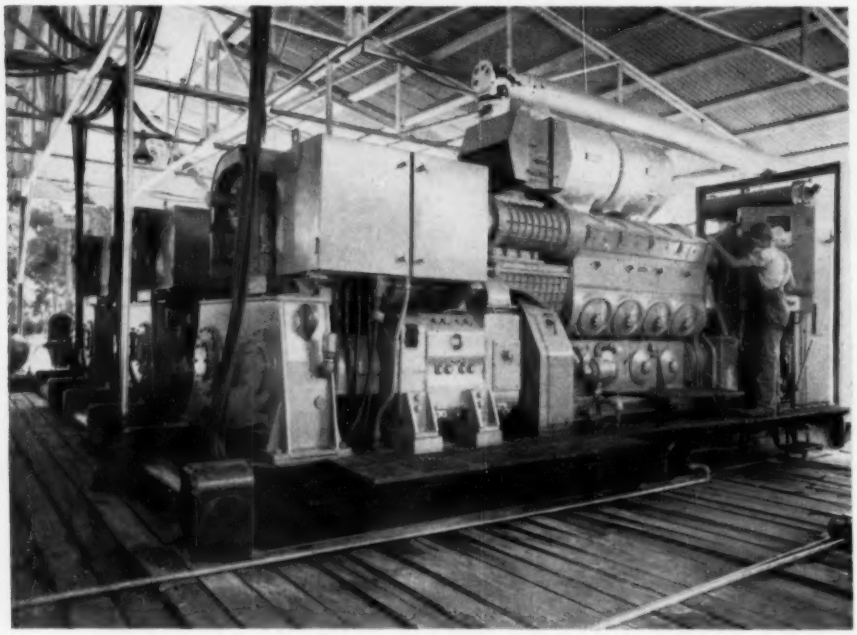
City_____ Zone____ State_____

☐ Please send booklet, "Diesel Dan's Manual."

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

It's Diesel-Electric for Shell on Cote Blanche Island

Portable, rapid-setup Electro-Motive Power choice for big rig in rugged Louisiana swamp



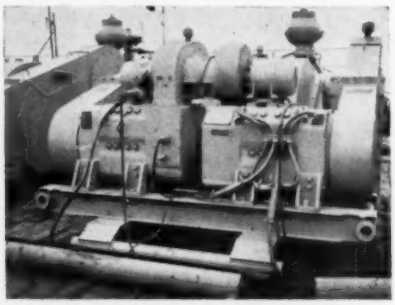
To work the swampy Cote Blanche Island field, Shell Oil Company faced two opposing requirements for their Rig 11. First, the rig had to be big, with power to drill over 18,000 feet. And second, it had to be easily portable to enable movement over primitive roads.

Shell's decision to use Diesel-Electric was influenced by the fact that this type power permits gathering almost all equipment into easy-handling, skid-mounted packages. In spite of rough terrain, rig-up can be completed in record time.

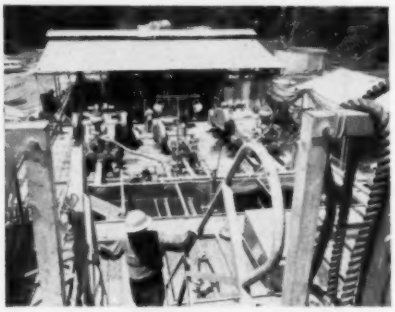
Electric conductors running from generating units to drive motors provide flexibility in locating equipment to suit conditions. This design avoids clutter, reduces rig-up and rig-down time and makes a big rig far more economical to move. Also, with few modifications, equipment can be adapted for offshore drilling.

Three Electro-Motive SR-8, 875-hp. Diesel generating units driving nine 625-hp. d.c. motors provide the drilling power for Rig 11. Its first hole is scheduled for 18,500 feet, using a 14,000 foot, 9⅝ in. protective string. It takes big power to drill below the overhang of the salt dome in this area, and this rig has it.

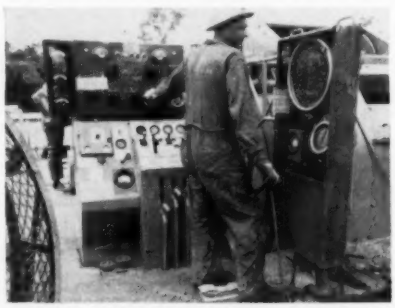
Electro-Motive Power is adaptable to many different types of drilling devices on land or water. For complete details on how it might fit your own particular requirements, contact your Electro-Motive representative.



Drive motors are 625-hp. direct current type for smooth, rapid acceleration of loads and positive control of speed and torque. Each main pump has two 625-hp. motors for a total of 1,250-hp.



Simple, flexible conductors connect generating sets to drive motors, allowing complete flexibility of arrangement. Rig-up time is reduced considerably because components are located to fit the site.



Driller's control is located next to draw works. From a central position, driller has control of Diesel-Electric equipment, including engine speed, pumps, hoist, rotary table and safety shutdown.

Derrick on Rig 11 is a big one—147 feet. It was modified for platform drilling, but can be extended to 189 feet.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

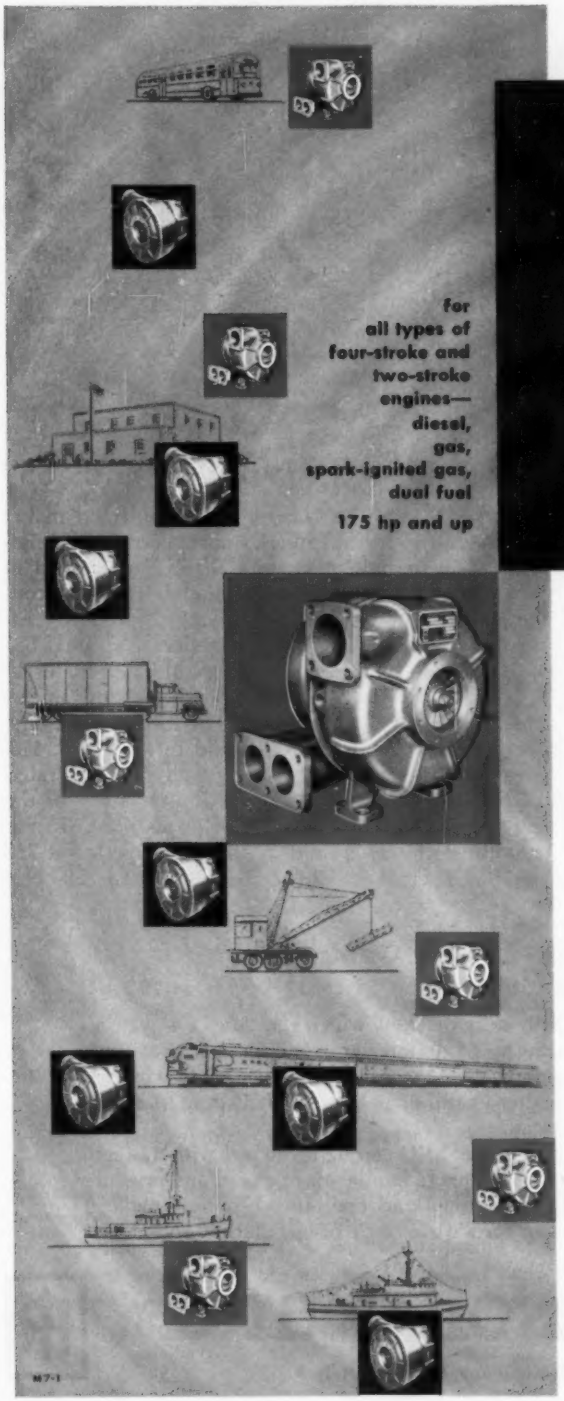
LA GRANGE, ILLINOIS

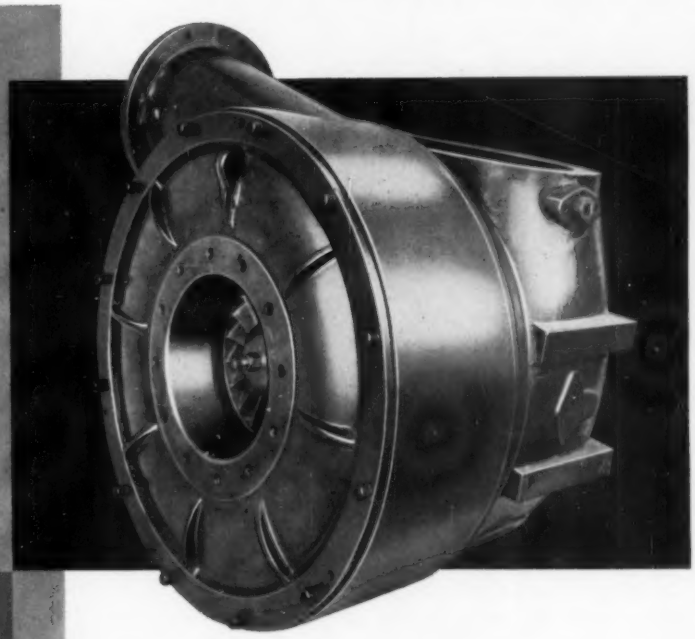
In Canada: General Motors Diesel Limited, London, Ontario

Petroleum industry sales offices: Tulsa, Oklahoma; Houston, Texas; Dallas, Texas; Morgan City, Louisiana; Pasadena, California.

Billions of hours . . .
of trouble-free operation!

that's the service record of ELLIOTT turbochargers





For nearly 20 years, Elliott has designed and manufactured turbochargers that are successfully serving diesel engines all over the world. Their high-pressure delivery improves engine performance, output and operation. The secret of their remarkable high-quality performance is *simple design, and rugged construction.*

Engineered for many hours of steady, dependable service, Elliott turbochargers provide pressure ratios up to 3.0 and flows of 400 to 14,000 cfm. The superior design permits easy accessibility for routine cleaning and maintenance. Covering the field of turbocharged engines, Elliott turbochargers serve locomotives, ships, drilling rigs, generating plants, pipeline stations, trucks, tractors, busses, etc. Write today for further engineering data.

ELLIOTT Company
Turbocharger Department
JEANNETTE, PENNSYLVANIA, U.S.A.

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

heavy-duty diesels

set the standards of dependability for continuous service at full capacity

200 to 380 hp Type "TS"

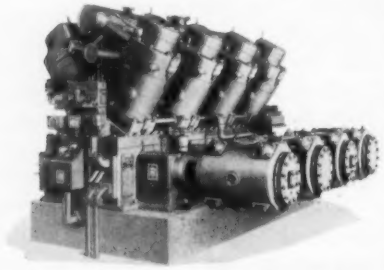
With the Ingersoll-Rand "TS" Diesel, you get big-engine performance in a small package. The "TS" is a modern speed, continuous service engine . . . with all the features essential to long life that are usually found only in much larger engines. The "TS" is a four-cycle, single-acting, solid-injection engine of the fully enclosed type and is equipped with a complete pressure lubrication system, wet liners and many other "big engine" features.

The TS has a bore of 7 inches and a stroke of 8½ inches. It is built in three models: a 6 cylinder naturally aspirated unit rated 200 hp at 900 rpm or 220 hp at 1000 rpm: a 6 cylinder supercharged engine rated 260 hp at 900 rpm or 285 hp at 1000 rpm: and an 8 cylinder supercharged model rated 345 hp at 900 rpm or 380 hp at 1000 rpm.

375 to 1000 hp Type "S" and "SS"

With the "S" and "SS" Diesels, Ingersoll-Rand makes available all of the advantages of modern diesel engineering – in a line of engines that is unequalled in year-after-year economy and dependability under continuous heavy-duty service.

Built with 5, 6, 7 and 8 cylinders, "S" and "SS" engines have a bore of 10½ inches and a stroke of 12 inches. They are fully enclosed, solid-injection, single-acting units that operate on the 4-stroke cycle. The Type "S" is naturally-aspirated and rated at 375, 450, 525 and 600 hp. "SS" units are supercharged and rated at 570, 715, 785 and 900 hp. With intercooling of the charging air "SS" engines will develop 600, 750, 875 and 1000 hp. Both the "S" and "SS" engines operate at 720 rpm for 60-cycle service and 750 rpm for 50-cycle service.



SVO Diesel-Engine Compressor

5 sizes . . . capacities from 1065 to 3200 cfm at 100 psi

The SVO is a heavy-duty machine which combines a 4-cycle V-angle Diesel engine and a double-acting compressor in a single frame. It is designed for economy and dependability in continuous service either at full or part loads. It is easy to install, operate and maintain.

Built in five sizes, the SVO can be furnished with 12-inch-stroke compressor cylinders to handle air or gas at any pressure or vacuum. Its compactness and operating economy make it an ideal compressor for a wide range of installations.

Your nearest Ingersoll-Rand engineer will be glad to tell you more about I-R Diesel engines and engine-driven compressors.

Ingersoll-Rand

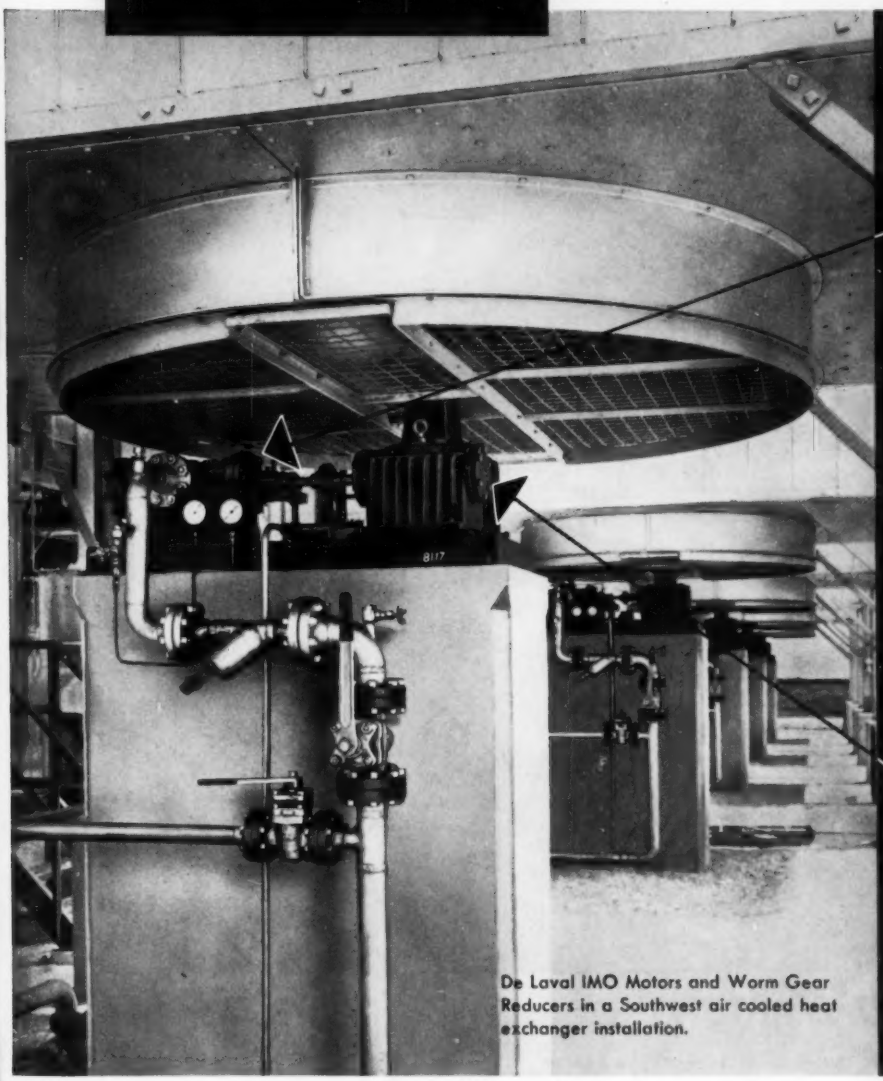
7-601

11 Broadway, New York 4, N. Y.

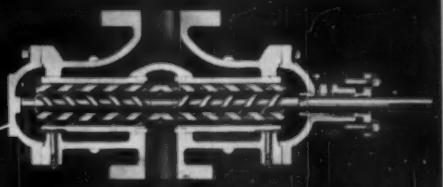
PUMPS · COMPRESSORS · DIESEL AND GAS ENGINES · AIR & ELECTRIC TOOLS · TURBO BLOWERS · CONDENSERS

DE LAVAL
HYDRAULIC FAN DRIVES

do dependable, power-saving job in air-cooled cooling towers

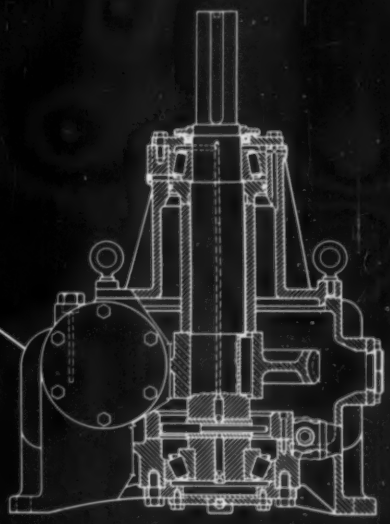


De Laval IMO Motors and Pumps



simple, reliable, pulsation-free

De Laval Worm Gear Speed Reducers



ruggedly built for severe service

De Laval IMO Motors and Worm Gear Reducers in a Southwest air cooled heat exchanger installation.

De Laval Hydraulic Fan Drives for air cooled heat exchangers and cooling towers *save power* since the fan operates at full speed only a portion of the time. Furthermore, there is no demand charge on hydraulic power. • Equally important, they provide *accurate, automatic* control of engine jacket water temperature, and also assure *complete operational flexibility*. Due to the simplicity of De Laval IMO motors and pumps as well as the rugged construction of De Laval Worm Gear Reducers, these units stay on the job for years. Both IMO motor and speed reducer are mounted and factory aligned on a single bedplate.

Investigate *all* the advantages of De Laval Hydraulic Fan Drives. Send for your copy of Bulletin 3009 which includes helpful performance data.

DE LAVAL *Hydraulic Fan Drives*

DE LAVAL STEAM TURBINE COMPANY

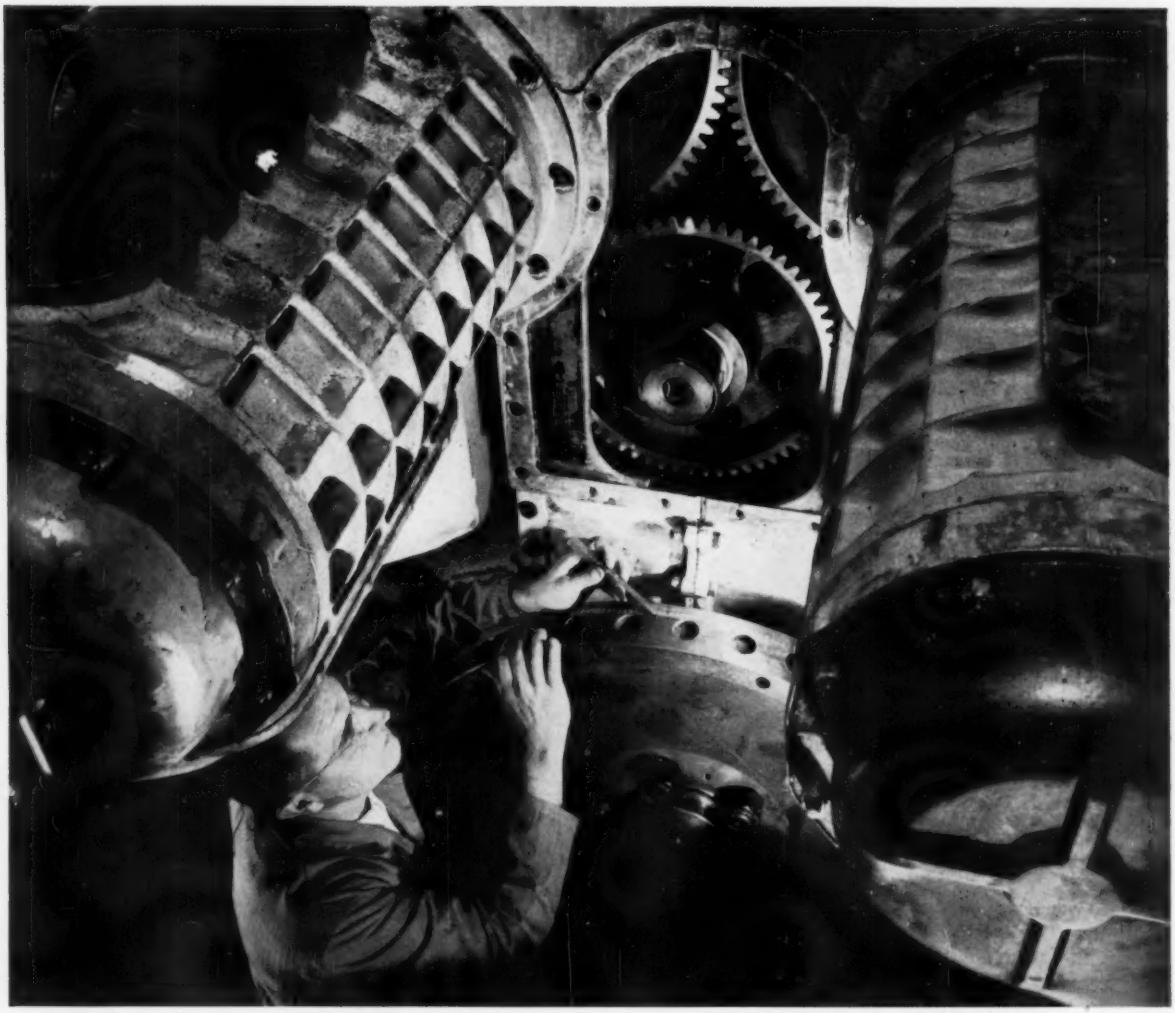
890 Nottingham Way, Trenton 2, New Jersey

DL370

ENGINEER'S FIELD REPORT

PRODUCT RPM DELO OIL RR

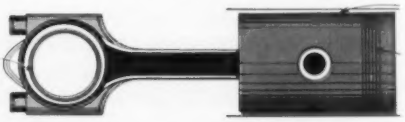
FIRM NORTHERN PACIFIC RAILWAY
South Tacoma, Wash.



RR diesel gears show only ½° wear in 2½ million miles

Timing gears on this Northern Pacific GMC-diesel locomotive engine, lubricated with RPM DELO Oil RR, recently completed 2½ million miles of severe freight service without repairs or adjustment. NP's South Tacoma Shop Foreman, A. R. Genin (above), indicates degree marks on engine flywheel, used to gauge gear wear. Tolerance between gear teeth shows variance of just ½° from original setting. Mr. Genin says, "We consider this low rate of wear remarkable for heavy-duty freight operation. It is typical of our experience during the 12 years we have used RPM DELO Oil in all our locomotive diesels." Engines are 1350 h.p. 16-567 series.

Why RPM DELO Oil RR reduces wear, corrosion



• Oil stays on engine parts—hot or cold, running or idle • Anti-oxidant resists lacquer formation • Detergent keeps parts clean • Special compounds prevent corrosion of bearing metals • Inhibitor resists foaming.

LUBRICATING OILS RPM DELO

TRADEMARK "RPM DELO" AND DESIGN REG. U. S. PAT. OFF

For More Information about RPM DELO Oils or other petroleum products of any kind, or the name and address of your nearest distributor, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey
STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA COMPANY, Denver 1, Colorado

They ALL Like Allis-Chalmers MARINE DIESELS and Generator Sets

The Boat Operator knows that every Allis-Chalmers marine diesel is backed by the company's long reputation for building engines that are *tops* in dependability and economy.

The Captain likes the true working horsepower on the shaft, at speeds that can be used. He likes the continuous-duty rugged power, the reserve built into Allis-Chalmers diesels.

The Engineer finds there are 30 to 50 percent fewer parts — that they are simple, easily accessible, require fewer adjustments. Maintenance and servicing time is reduced to a minimum.

Everyone likes the 3-deep parts and service backing from our dealers, our 18 strategically located company branches and the factory.

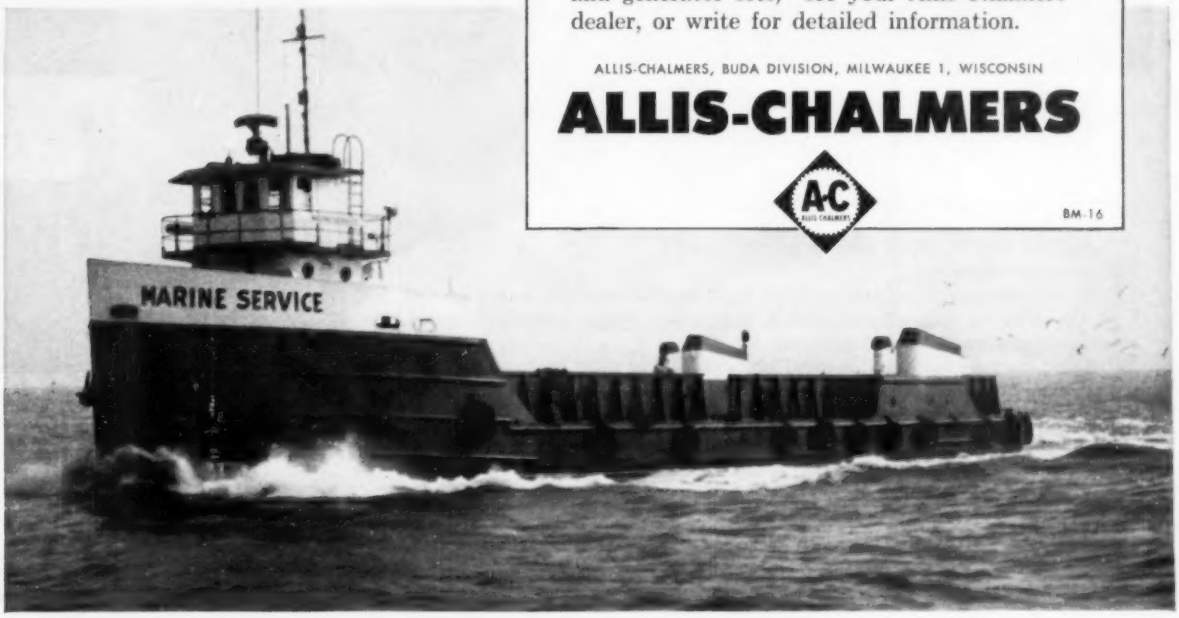
For more reasons why "they all like Allis-Chalmers marine diesels and generator sets," see your Allis-Chalmers dealer, or write for detailed information.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

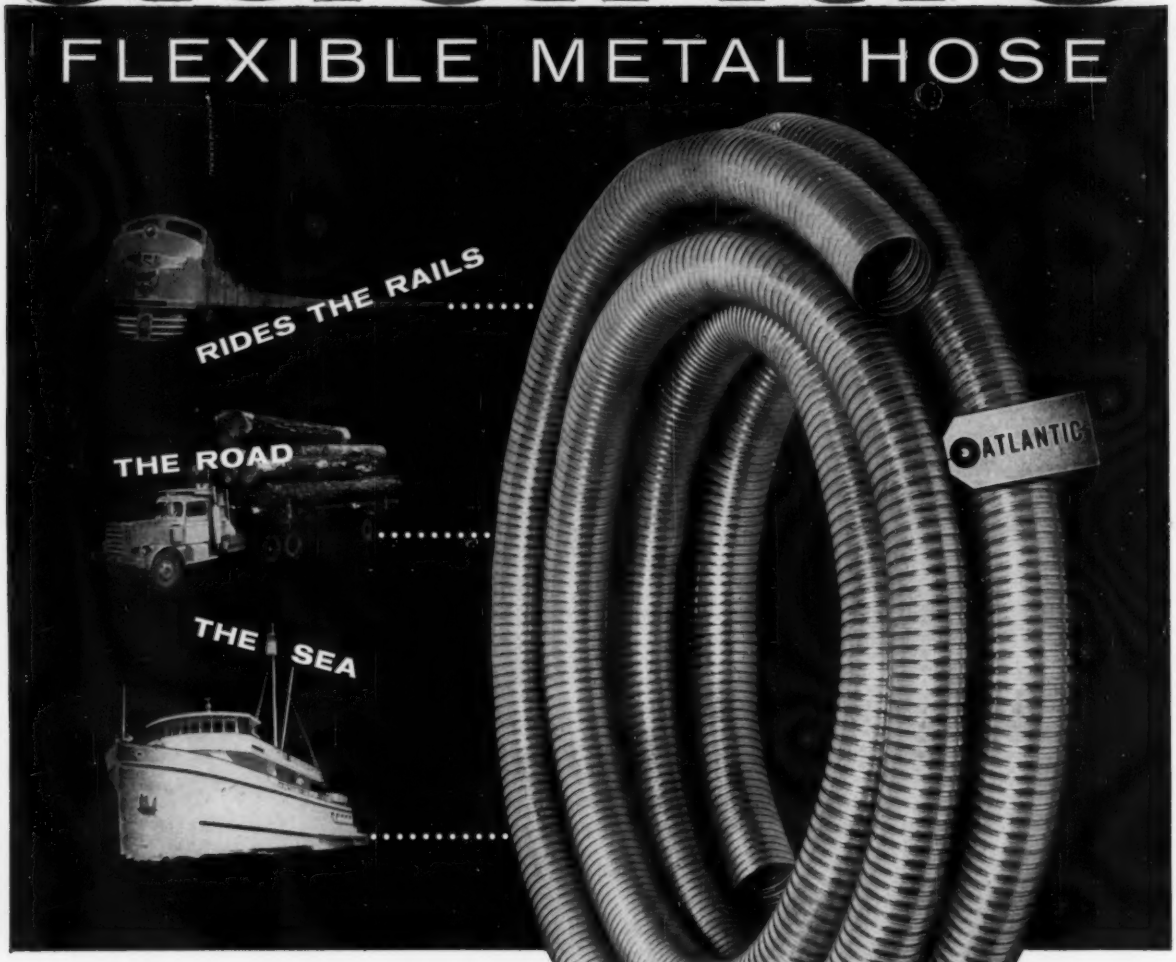
BM-16

The *M/V Marine Service*, powered by two Allis-Chalmers 516-hp supercharged diesel engines and two 30-KW generator sets, is one of several large supply ships in the Sea Service, Inc., fleet providing reliable cargo service to the off-shore petroleum industry. Altogether, there are over 10,000 hp of Allis-Chalmers diesels in the Sea Service cargo and crew boat fleet.



atlantic

FLEXIBLE METAL HOSE

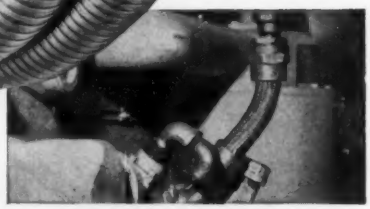


When diesels power trucks hauling 70,000 lb. loads of logs over mountain roads — or locomotives and ships, Atlantic flexible metal hose is usually given the job of guarding those vital diesel life lines—water, fuel, exhaust.

Atlantic flexible metal hose is manufactured to tough specifications.

Wall thickness is absolutely uniform. Tight against water, oil, steam, gas and air. Requires no maintenance. Atlantic flexible metal hose dampens vibration, remains flexible at higher temperatures.

There is an Atlantic flexible metal hose for each of these applications. Made in bronze, steel, stainless and monel—⅛"-36" I.D. with required fittings.



For misalignment and vibration

JOB TESTED CERTIFIED

Write for Diesel Bulletins 1020 & 50A. See our Catalog in Sweet's Product Design File.

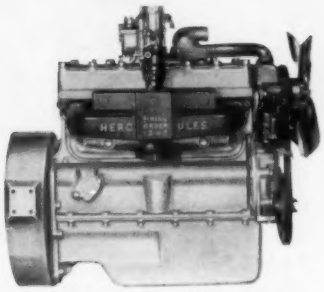
ATLANTIC METAL HOSE CO., INC.

309 DYCKMAN ST., NEW YORK 34, N. Y.

Now— HERCULES OFFERS...

All four types of engines from one dependable source

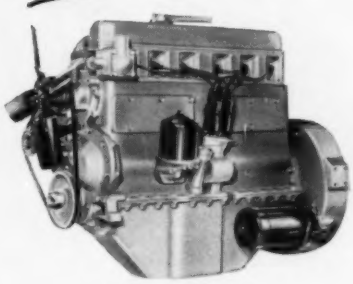
GASOLINE



L-HEAD

The famous Hercules L-head design is available in 36 models from 39 to 935 cu. in. displ. These compact engines have a reputation for long-life and dependable service.

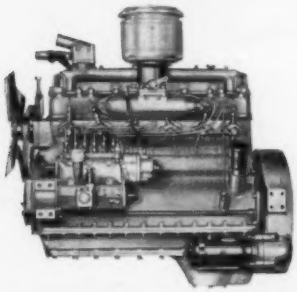
NEW



GO SERIES
Overhead Valve

These engines are available in 4 and 6 cylinder sizes from 173 to 339 cu. in. displ. The GO series is interchangeable with the new DD series, thus providing the option of gasoline or diesel power.

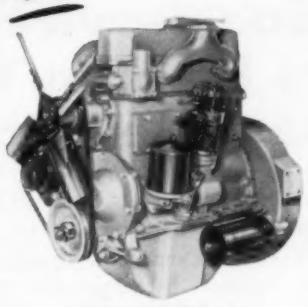
DIESEL



TURBULENCE CHAMBER

32 models of these high-speed heavy-duty diesel engines are available in 2, 4, 6 and 8 cylinder sizes from 83 to 1468 cu. in. displ. Many different versions are available.

NEW



DD SERIES
Direct Injection

In addition to having interchangeable mounting dimensions with the GO series, these engines have many interchangeable parts and accessories. For more details on any engine listed at right, contact the factory.

HERCULES MOTORS CORPORATION
Canton 2, Ohio

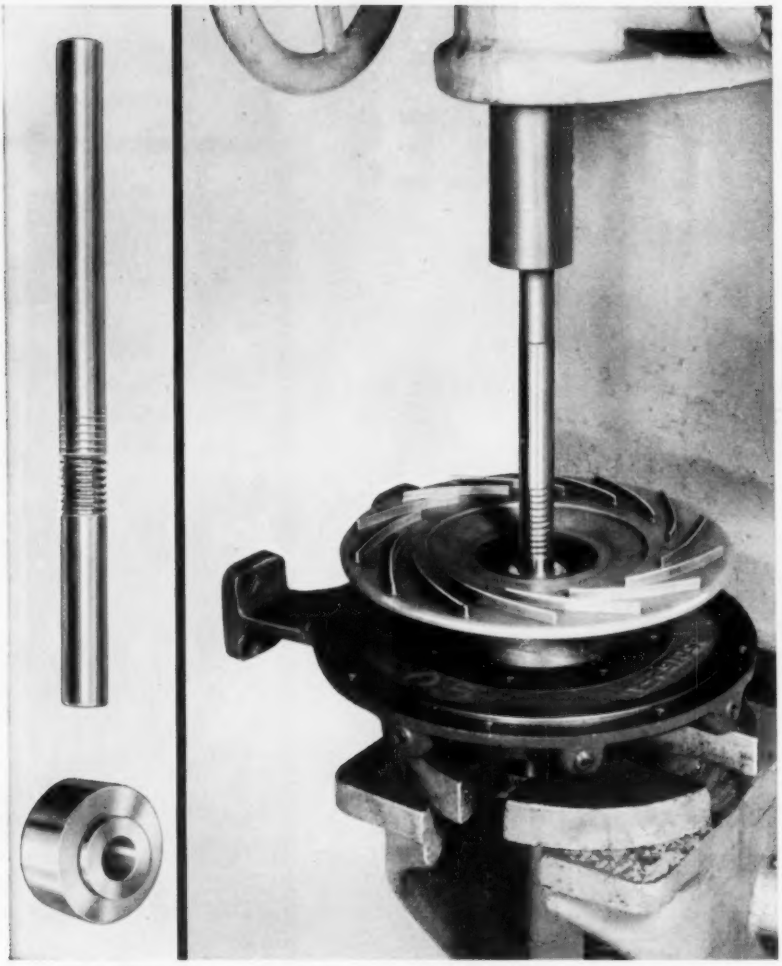
GASOLINE

2 CYLINDER		
BXB	2⅞" x 3"	39
NXA	3" x 4"	56.5
NXB	3¼" x 4"	66.3
3 CYLINDER		
G. O. 130	3½" x 4½"	130
G. O. 149	3¾" x 4½"	149
G. O. 169	4" x 4½"	169
4 CYLINDER		
ZXA	2½" x 3"	59
ZXB	2⅝" x 3"	65
IXA	3" x 4"	113
IXB	3¼" x 4"	133
IXLB	3¼" x 4¼"	141
JX4E	3½" x 4¼"	164
G.O. 173	3½" x 4½"	173
JX4C	3¾" x 4¼"	188
G.O. 198	3¾" x 4½"	198
JX4D	4" x 4¼"	214
G.O. 226	4" x 4½"	226
● **6 CYLINDER**		
QXA	3⅛" x 4⅛"	190
QXB	3¼" x 4⅛"	205
QXC	3⅜" x 4⅛"	221
QXD	3⅞" x 4⅛"	230
QXLD	3⅞" x 4¼"	236.7
JXE	3½" x 4¼"	245
JXB	3⅝" x 4¼"	263
G.O. 260	3¼" x 4½"	260
JXC	3¾" x 4¼"	282
G.O. 298	3¾" x 4½"	298
JXD	4" x 4¼"	320
G.O. 339	4" x 4½"	339
JXLD	4" x 4½"	339
WXC-3	4¼" x 4½"	383
WXLC	4" x 4¾"	358
WXLC-3	4¼" x 4¾"	404
TDXB	4⅜" x 5¼"	474
TDXC	4½" x 5¼"	501
RXB	4½" x 5¼"	501
RXC	4⅝" x 5¼"	529
RXLC	4⅝" x 5¼"	529
RXLD	4¾" x 5¼"	558
RXLDH	4¾" x 5¼"	558
HXB	5" x 6"	707
HXC	5¼" x 6"	779
HXD	5½" x 6"	855
HXE	5¾" x 6"	935
‡HXE	5¾" x 6"	935

‡Dual Carburetion

DIESEL

2 CYLINDER		
DIX-83	3⅝"x4"	83
DIXC	4"x4½"	113.1
DIXD	4¼"x4½"	127.5
3 CYLINDER		
D. D. 130	3½"x4½"	130
D. D. 149	3¾"x4½"	149
D. D. 169	4"x4½"	169
4 CYLINDER		
DIX4B	3¼"x4"	133
DIX4D	3⅝"x4"	166
D.D. 173	3½"x4½"	173
DOOB	3¾"x4½"	198.8
D.D. 198	3¾"x4½"	198
DOOC	4"x4½"	226.2
D.D. 226	4"x4½"	226
DOOD	4¼"x4½"	255
6 CYLINDER		
DIX6D	3⅝"x4"	248
DIX6-272	3¹¹⁄₁₆"x4¼"	272
DJXB	3½"x4½"	260
D.D. 260	3½"x4½"	260
DJXC	3¾"x4½"	298
D.D. 298	3¾"x4½"	298
DJXH	3¾"x4½"	298
D.D. 339	4"x4½"	339
DJXHF	3¾"x4½"	298
DWXC	4"x4¾"	358
DWXD	4¼"x4¾"	404
DWXLD	4¼"x5"	426
DWXLDF	4¼"x5"	426
DRXB	4⅜"x5¼"	474
TCD-501	4½"x5¼"	501
DRXC	4⅝"x5¼"	529
DFXB	5"x6"	707
DFXC	5¼"x6"	779
DFXD	5½"x6"	855
DFXE	5⅝"x6"	895
TCD-895	5⅝"x6"	895
DFXH	5¾"x6"	935
DFXHF	5¾"x6"	935
8 CYLINDER		
DNX-V8D	6¼"x6"	1468
TCD-1468	6¼"x6"	1468



57-H2 Broaching and Burnishing Turbocharger Bearings—A Most Critical Operation—Easily Performed With Kent-Moore's Bearing Broach Set

NOW—You Can Service Turbochargers Right In Your Shop With These New Tools!

New service tools by Kent-Moore permit overhaul and repair of the Elliott M-5 and M-10 Turbochargers *right in your shop*. Eliminate delay and expense of returning Turbocharger to factory for service—return your diesel power to operation quicker. Tools duplicate factory tolerances, fits, and finishes. Cost of tools can be justified on first overhaul job.

Nine Kent-Moore special tools for each Turbocharger easily remove and replace bearings, burnish bearings to precision tolerances, ream turbine and blower end seals, and do other service operations.

For More Information—Write to:

KENT-MOORE ORGANIZATION, INC.

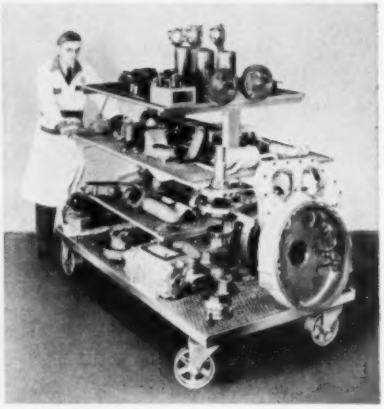
1501 So. Jackson St., Jackson, Michigan

ENGINEERS AND MANUFACTURERS OF SPECIAL SERVICE TOOLS AND EQUIPMENT

TIPS

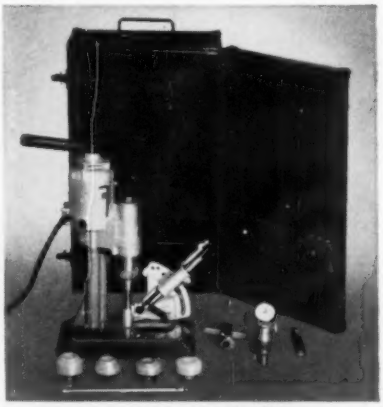
ON HOW TO SAVE TIME, CUT COSTS WITH SPECIAL EQUIPMENT BY KENT-MOORE

COMPACT, PORTABLE PARTS RACK SPEEDS DIESEL ENGINE OVERHAUL



J 6387 Parts Rack

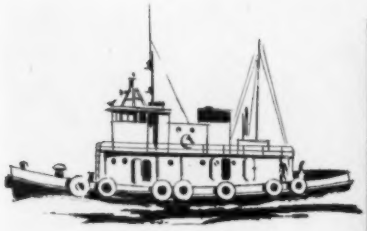
This Kent-Moore Portable Parts Rack holds *all* the parts of a complete diesel without stacking. Over 60 square feet of shelf space *rolls* to wherever you work where parts are at your fingertips for inspection and assembly. Damageable points are cushioned in rubber and plastic and adjustable holders secure the crankshaft and flywheel. For Detroit Diesel Engines, Series 51, 71, 110 —but adaptable to *any* diesel.



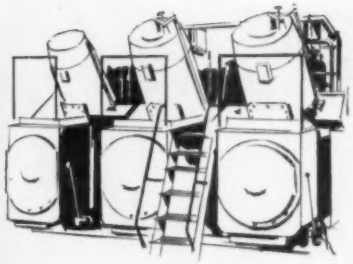
Duplicate Factory Finish With J 8165 Eccentric Valve Seat Grinder

Utilizing the point-contact grinding principle, the J 8165 Eccentric Valve Seat Grinder produces greater precision and finer finishes at lower cost. More seats can be ground per wheel with less frequent stone dressing due to the micrometer feed which allows greater accuracy with less wheel breakage.

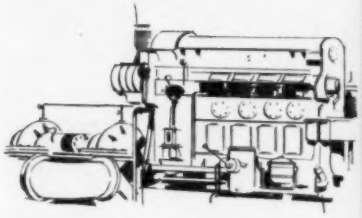
Basic Set pictured is applicable to Series 71 2-Valve Head Engines. The following Adapter Sets are also available: J 4627 for Series 110 Engines and J 6390 for Series 71 4-Valve Head Engines.



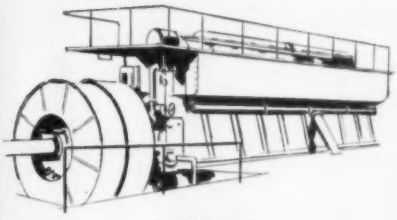
Marine



Engine compressor



Pumping



Stationary

GET THE BEST FROM THE POWER YOU BOUGHT...

WITH *Alnor*® PROTECTION

Accurate check of exhaust temperatures with an Alnor Pyrometer system can assure minimum fuel consumption per horsepower and long service from the power you bought—without the interruption of many common-cause breakdowns.

At a fraction of the cost of your present engine maintenance bill, an Alnor system can give you advanced warning of:

CYLINDER OVERLOAD	SCALED JACKETS	DETONATION
PREIGNITION	CLOGGED PORTS	FAULTY INJECTION

Series A Pyrometers are designed specifically for direct mounting on diesel engines or other equipment subject to vibration and rough usage. Readings are accurate to within + or —1%. Dustproof, fumeproof, splashproof. Switch capacities of 4, 6, 8, 10, 12 and 16 circuits. Other models to 31 circuits. Get full information—by return mail. Send for Bulletin 4361 with complete details of the Pyrometer and thermocouple assembly designed for your engine.

Alnor

write:

ILLINOIS TESTING LABORATORIES, INC.

Room 507, 420 No. LaSalle St., Chicago 10, Illinois

Mining (Rock & Gravel) . . . Caterpillar D7 Tractor
Roadbuilding . . . Caterpillar DW21 and D8 Tractors
Grading . . . Adams "550" Grader
Construction . . . Caterpillar D8 Tractor
Excavating . . . Marion 111 Shovel
Arch Logging . . . Caterpillar D8 Tractor

they've all got this in common...

protection from dirt with Purolator filters

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada
Agents in principal cities.

When several manufacturers install the same line of filters on a wide variety of equipment, there must be a good reason. For all the equipment shown above the reason is simply this: Purolator filters remove more dirt. That's all there is to it. In terms of engine wear, performance, and long life, this can mean the difference between dependable operation and breakdown. That's why more and more manufacturers of equipment which must operate in dirt and dust insist on the extra percentage of protection given by Purolator filters. Purolator's complete line for construction equipment includes filters for air, fuel, lubrication oils, and hydraulic systems; plus a complete line of screens and strainers.

Specialists in...

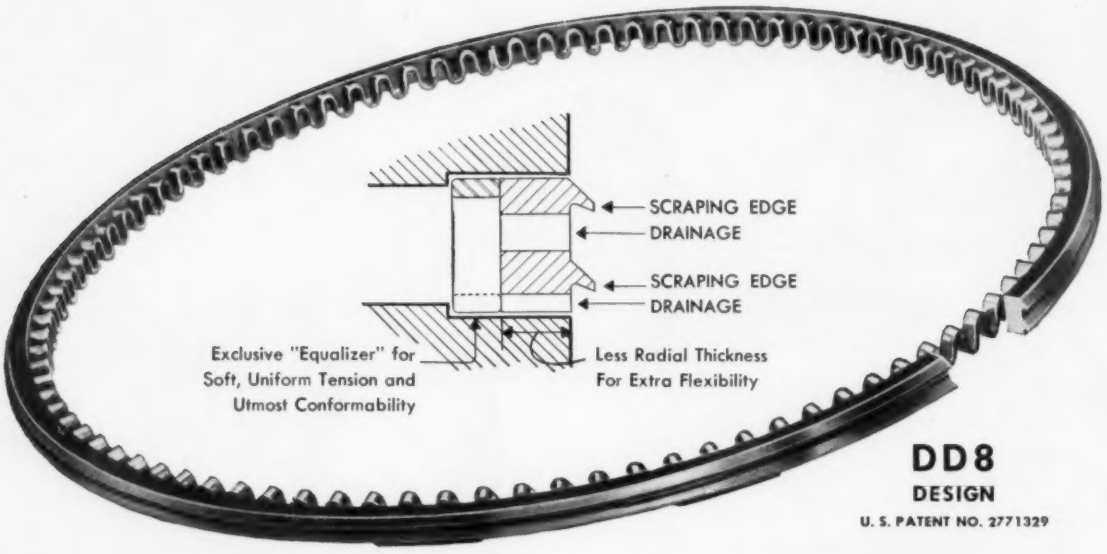
FLUID FLOW & VIBRATION DAMPING PRODUCTS

SCHWITZER
CORPORATION
INDIANAPOLIS, INDIANA

TURBOCHARGERS	FAN DRIVES	WATER PUMPS
SUPERCHARGERS	ACCESSORY DRIVES	OIL PUMPS
FAN BLADES	VIBRATION DAMPERS	SHAFT SEALS

Another PEDRICK *"First"*

A Single-Piece Cast Iron Conformable Oil-Control Piston Ring with TWO Scraping Edges and Drainage Under Each!



Pedrick Conformable FORMFLEX Double-Drain Oil Ring

Pedrick's DD8 Formflex oil ring assures far better oil control, especially on pistons with oil drainage through the grooves instead of below the grooves. Three of the most important reasons are:

1. TWO oil-scraping edges.
2. TWO sets of drainage channels or slots, one under each scraping edge.
3. Exceptional *conformability* for positive contact with the cylinder wall under even the most severe conditions.

Conformability is assured because of Pedrick's exclusive "Equalizer," a special design of steel expander which exerts a uniform pressure all the way around the cast-iron cylinder-contacting ring. The radial thickness of the cast-iron ring is less also, which increases its flexibility.

The Pedrick FORMFLEX Double-Drain DD8 oil ring, therefore, provides quicker, more effective drainage, and increased performance efficiency in all piston-groove styles. It is easy to install and moderate in cost.

This is just one of a family of top-flight ring designs which Pedrick has available to assure you long dependable, low-cost engine operation. Say the word and our engineers will be glad to consult with you. WILKENING MANUFACTURING CO., Philadelphia 42 and Toronto 2.

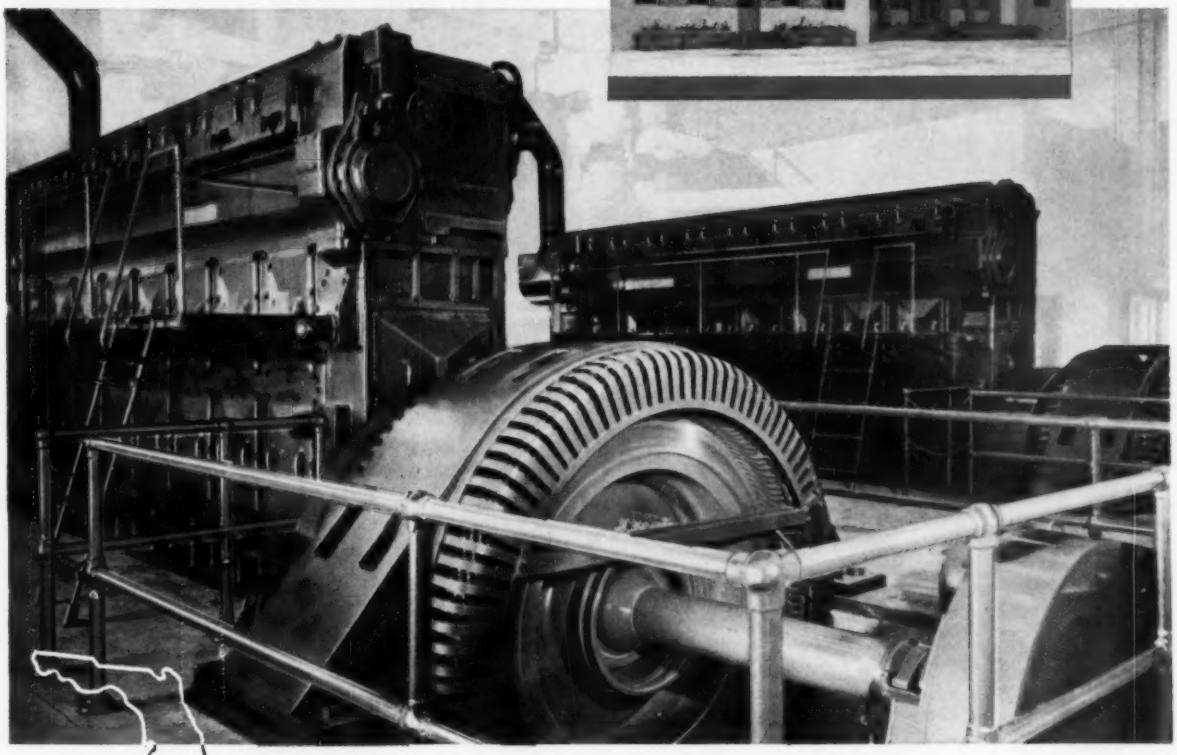
Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* RINGS FOR BIG-BORE ENGINES

powered by

White's Superior Diesels

on heavy fuel



Marathon power plant saves $25,518 yearly!

True to the Florida town name of "Marathon," two dependable White Superior Model 80 Diesels are winning a real endurance contest at Florida Keys Electric Co-op Plant No. 2. Carrying base load in an area of tremendously increasing local demand, these rugged 8-cylinder 1422 HP supercharged diesels run almost 95% of the time on No. 6 residual fuel. For starting and stopping, No. 2 fuel is used. Saving is $25,518 yearly compared to cost of 100% operation on No. 2 fuel. Each 1000 KW unit is running almost continuously at rated output. In their first full year, they produced 10,638,410 gross KWH at a low fuel cost of 4.699 mills per KWH.

Economical operation on low cost heavy fuel results from Superior's highly developed open chamber combustion system plus special equipment and techniques perfected by White Diesel engineers. Rugged, heavy duty construction and high quality features enable Superiors to operate with minimum maintenance even where mushrooming local demand calls for peak output.

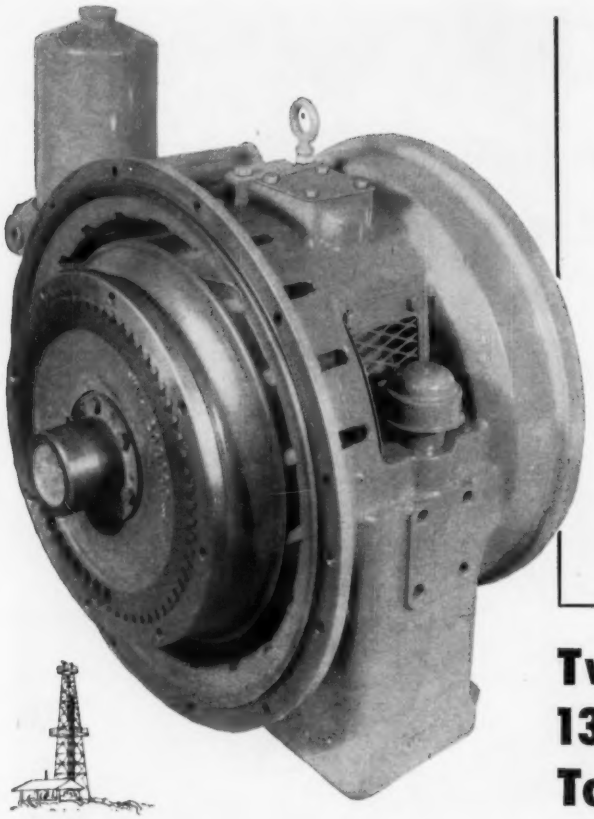
If extreme economy under "marathon" operating conditions interests you, call or write the nearest office listed below. Let White's engineers discuss the many outstanding features of Superior and Atlas engines, ranging from 100 to 2150 HP, for power to 1500 KW.

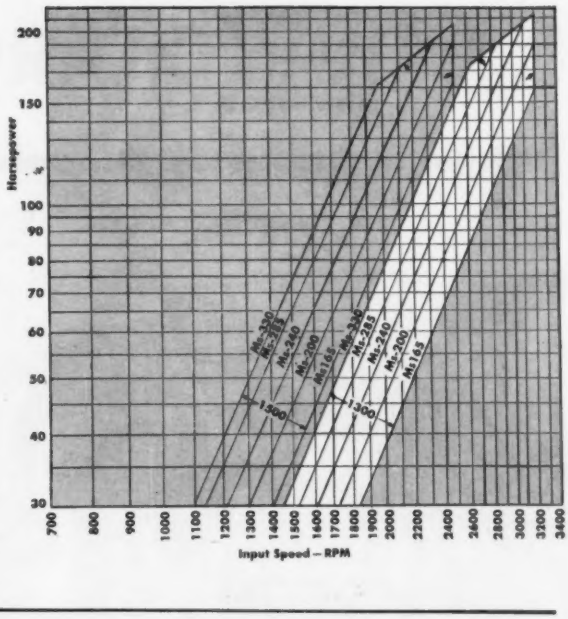
White Diesel

WHITE DIESEL ENGINE DIVISION

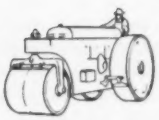
THE WHITE MOTOR COMPANY Plant and General Offices: Springfield, O.

SALES AND SERVICE POINTS: Ketchikan, Alaska • San Francisco, Terminal Island, California • Denver, Colorado • Washington, D.C. • Clearwater, Florida • New Orleans, Louisiana • Boston, Mass. • Park Rapids, Minnesota • Webster Groves, Missouri • Callaway, Nebraska • New York, N.Y. • Tulsa, Okla. • Portland, Astoria, Ore. • Ft. Worth, Houston, Texas • Seattle, Wash. • Halifax, Nova Scotia • Vancouver, B.C.





Twin Disc offers new 1300 Series Single-Stage Torque Converters



To meet the growing trend toward higher speed diesel and gasoline engines, Twin Disc Clutch Company announces its new 1300 Series Single-Stage Torque Converters . . . a series that offers ideal torque ratings for shovels, materials handling equipment, small industrial locomotives, front-end loaders, hoisting machinery, road rollers, graders and many similar applications.

The new 1300 Series Single-Stage Torque Converters are rated from 30 hp at 1450 rpm to 212 hp at 3200 rpm . . . with impellers available for specific torque ratings of 165, 200, 240, 285 and 330 pound-feet.

Current production of the 1300 Series consists of one model—the Model "F." This is a spacer-type arrangement with an SAE No. 2 flywheel housing size and either an SAE No. 2 or No. 3 output housing.

Like the Twin Disc 1500 Series Single-Stage units, the 1300 Series has an exclusive blade design which develops a counter-head at high-speed ratios, stopping fluid circulation. This simplifies design and construction and eliminates the need for a free-wheeled stator.

Impellers having different bladings (both number of blades and pitch) are interchangeable, permitting torque capacities to be matched more accurately to engines of various hp sizes and speeds.

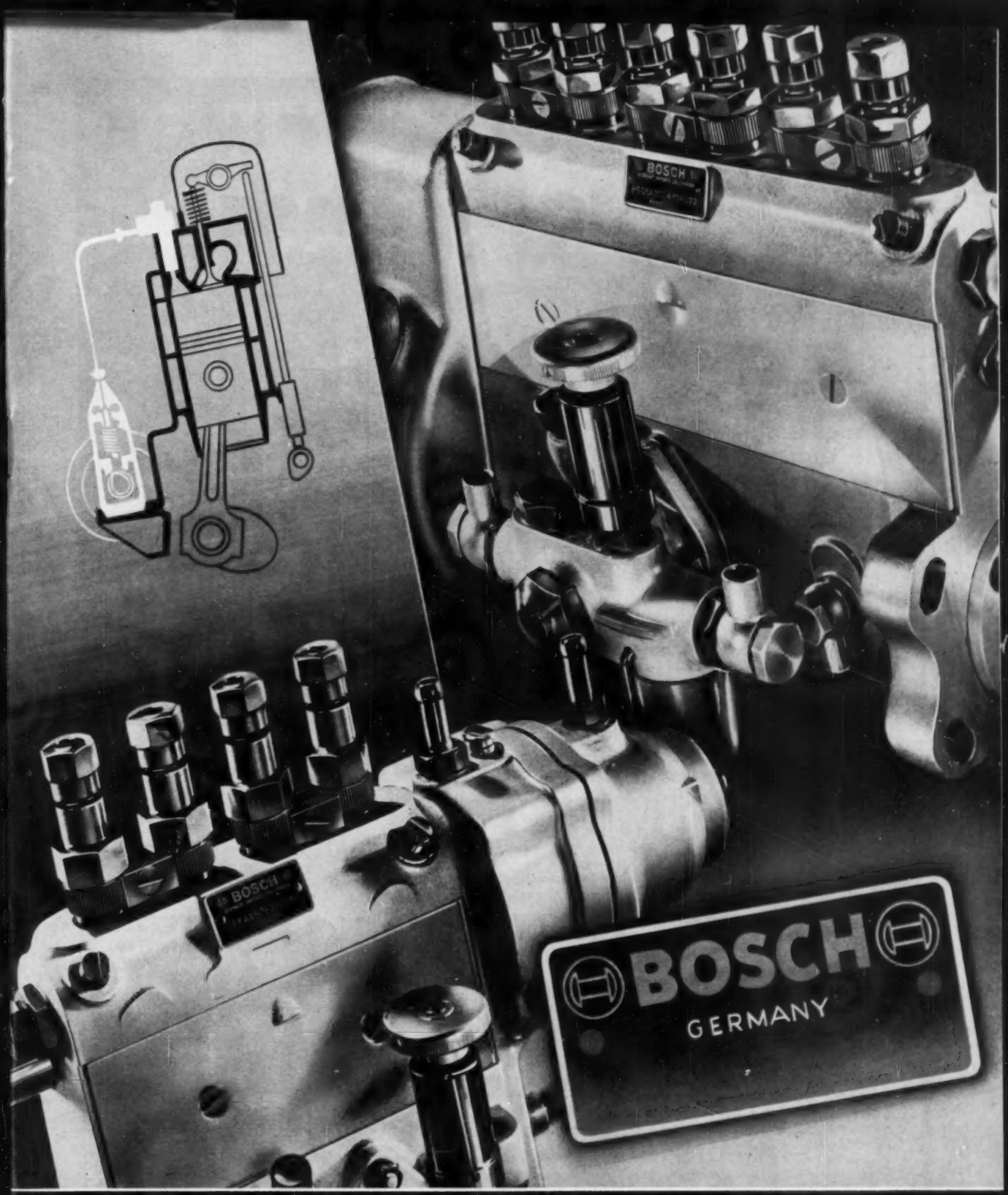
The 1300 Series cooling requirements are minimized because of a rotating impeller housing which provides air circulation through the ventilated stationary housing.

If you've been considering a torque converter in your machinery designs, or are dissatisfied with your current single-stage units, investigate today the benefits offered by the new Twin Disc Single-Stage Torque Converters. Write for Bulletin 508 Supplement.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois
Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa



ROBERT BOSCH CORPORATION

268 Fourth Avenue, New York 10, N. Y. • 225 Seventh Street, San Francisco 3, Cal.

Robert Bosch (Canada) Ltd., 5767 Monkland Ave., Montreal 28, Que.
Sales and Service Representatives for

ROBERT BOSCH GmbH, STUTTGART, GERMANY

Save horsepower at both ends

DONALDSON AIR CLEANERS and MUFFLERS

Cleaner air for combustion and less exhaust back pressure give you better performing engines that deliver full rated horsepower *longer*.

The truck shown above, operates both over the road and off the highway. Severe dust conditions are often encountered, but the Donaldson cleaner delivers dust-free air to the engine at all times, removing the cause of most wear.

At the other end of the combustion cycle a Donaldson muffler discharges exhaust gases with a low, pleasing tone . . . without harmful back pressure. The engine delivers full power on less fuel *and with less valve wear*.

Test the performance of your engine with a Donaldson air cleaner and muffler. Many leading manufacturers have found that by "going Donaldson all the way," they build customer satisfaction through better engine performance.

Donaldson

DONALDSON COMPANY, INC.

666 Pelham Blvd.
St. Paul, Minnesota

Grinnell, Iowa; Oelwein, Iowa • DONALDSON COMPANY (CANADA) Ltd., Chatham, Ontario

DIESEL FUEL and LUBRICATION

BULLETIN

CITIES SERVICE

TESTS SHOW CITIES SERVICE C-300 OIL HAS LOWEST BEARING LOSS

L-4 72 Hr. Engine Run

Bearing Loss, Ave mg.

CITIES SERVICE C-300 OIL	Brand A Oil	Brand B Oil	Brand C Oil	Brand D Oil	Brand E Oil	Brand F Oil	Brand G Oil
54	550	106	170	1109	601	89	1425

New test data reveals excellent reasons why sales of Cities Service C-300 Oil have doubled in two years.

These tests, comparing C-300 with 7 leading competitive oils, demonstrate that it has by far the lowest bearing loss of all oils tested.

In addition, the over-all performance rating of Cities Service C-300—which takes into account all aspects such as corrosion and oxidation resistance, oil consumption, and detergency—was also highest of all oils tested.

For diesel trucks, buses, farm equipment, and stationary diesels, Cities Service C-300 is unsurpassed. Ask your Cities Service Lubrication Engineer for performance data.

CITIES SERVICE DEVELOPS NEW OIL FOR SEVERE-DUTY EARTH MOVING MACHINERY

To meet the exacting requirements of certain severe-duty earth movers now manufactured by the Caterpillar Tractor Company and others, Cities Service has developed an extremely rugged new oil.

Known as Cities Service C-500, this new oil is approved by Caterpillar and specially made for service as a Series 3 Oil.

Your lubrication engineer will gladly discuss the features of this new oil and the precise machinery and conditions for which it is intended.

OVER 10,000 HOURS WITH CITIES SERVICE C-400 OIL— PISTONS CLEAN AS NEW!

A Mississippi tug was having trouble. Ring breakage and oil consumption made overhaul necessary practically every time it was docked.

Then Cities Service C-400 Diesel Engine Oil was tested.

Result: After over 10,000 hours, pistons were like new. No stuck or broken rings. Horsepower was increased 5%. Oil consumption chopped in half!

This story is typical of the kind of problems Cities Service solves throughout the year. If you have lubrication difficulties, consult your Cities Service Lubrication Engineer . . . it may save you a bundle.

MAN YOU SHOULD KNOW

William J. Varetoni is a Lubrication Engineer and Technical Consultant with the Cities Service office at 60 Wall Street, New York, N. Y. With 27 years' experience in the solution of lubrication problems, he is typical of the many Cities Service Lubrication Engineers who will gladly investigate your problems without obligation. A call to the nearest Cities Service office will bring one of these men to your plant or job site.

Typical of the 30 General Motors Training Centers, offering one-week courses in Delco-Remy equipment, is this Detroit unit.

THROUGH THESE PORTALS pass the best-trained heavy-duty electrical specialists in the business!

Nowadays the key to profit in truck and bus service lies in the speed and efficiency of your operations. To help you reach that level of efficiency, General Motors Training Centers offer you a one-week training course in Delco-Remy heavy-duty electrical equipment—without tuition or obligation. With 30 of these schools throughout the United States, chances are there's one near you.

Designed to teach speed and efficiency, this course gives you or your men a thorough grounding in up-to-date service methods and factory-specified procedures. Expert factory-trained instructors, using the modern testing and service equipment, are your teachers.

The checking, testing and repairing of Delco-Remy heavy-duty voltage regulators, generators, cranking motors, distributors and other units are covered in the most efficient way—through classroom and practical shop experience.

There is no tuition for the course. Tools, equipment and supplies needed during the training period are provided at no cost. The student's only expenses are his transportation, meals and accommodations.

If you are engaged in truck and bus electrical service, apply for this outstanding course for yourself or for your men. To arrange for admission, write direct to Service School, Delco-Remy, or contact your local United Motors System distributor.

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

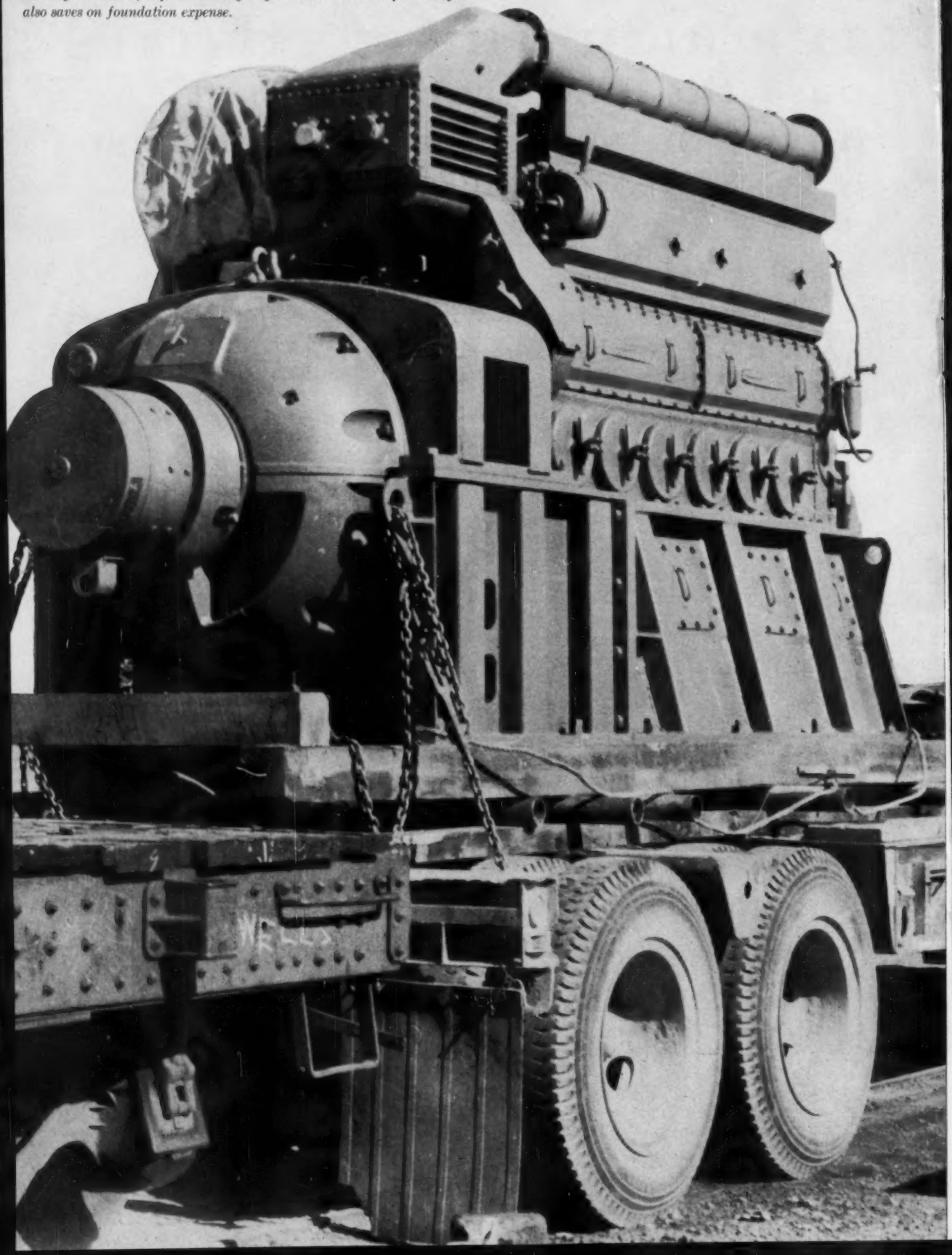
ELECTRICAL SYSTEMS

DELCO-REMY, DIVISION OF GENERAL MOTORS, ANDERSON, INDIANA

Only the most up-to-date testing equipment is used. Here a student adjusts a truck distributor on a testing machine.

Working with small groups, instructors are able to teach a great deal of automotive electricity in a short time.

500 KW IN ONE PACKAGE. *This "unitized" engine generator shipped already assembled, requires no aligning at the site. Its compact design also saves on foundation expense.*



1957 POWER!

Long famed for reliability, Worthington 1957 power engines have many new features that can help you produce permanent or standby power at the lowest costs ever achieved for real *heavy-duty* units.

LOWER INSTALLATION COSTS—The new SW 9 engine you see at left has been "unitized" with its generator to drastically cut space requirements, installation time and expense. This design requires no aligning at the site. Should needs ever change, the entire unit can just as easily be picked up and moved to another location.

LOWER FUEL COSTS—In 1957, Worthington is pioneering in power by designing and building engines *specifically* for turbo-charged operation. The SW 14, for example, is America's first high output diesel built only for high pressure turbo-charging.

For economy today *and* tomorrow, all '57 Worthington power engines can be furnished to run on the lowest cost, locally available fuels—residual, crude, and distillate oils; natural, sewage, propane or manufactured gas.

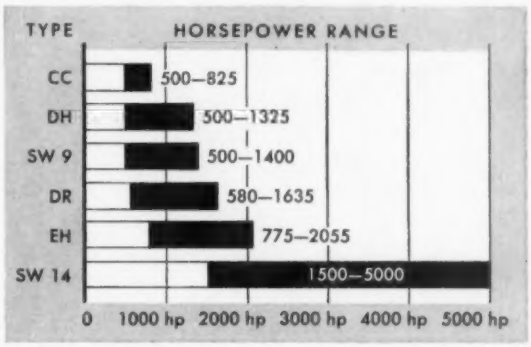
LOWER MAINTENANCE COSTS—With Worthington's 1957 engine line, you enjoy the economy of modern power design plus amazingly low maintenance. One of the many maintenance-saving features of the new SW 9, for example, is the Jet Swirl combustion chamber. The chamber is designed so that the air swirls as it enters the cylinder assuring rapid mixing of air and fuel for extremely clean combustion giving longer valve and liner life, as well as ultra-efficient operation.

The fact that every upper mechanical part is within reach from the operating level is another maintenance saving feature.

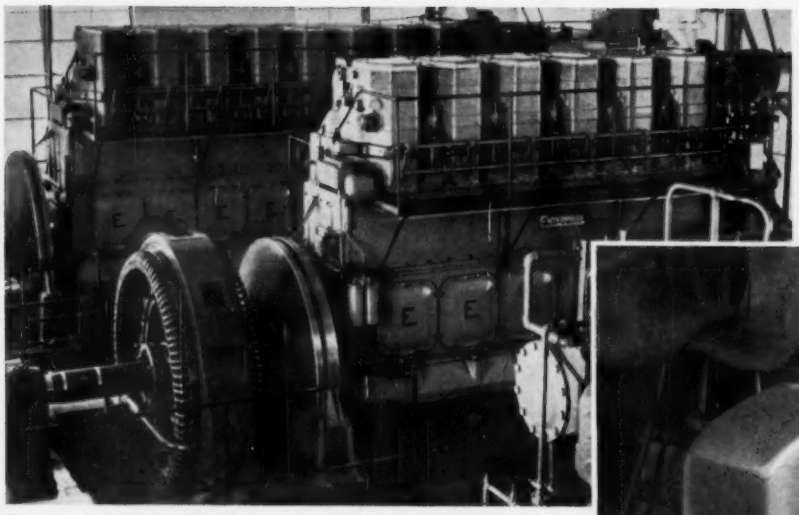
For reliable power in the 500 to 5,000 hp range, at the lowest possible cost, get in touch with your nearest Worthington District Office. Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

E-7-1

Choose your next diesel from Worthington's complete line of heavy-duty four-cycle power engines.

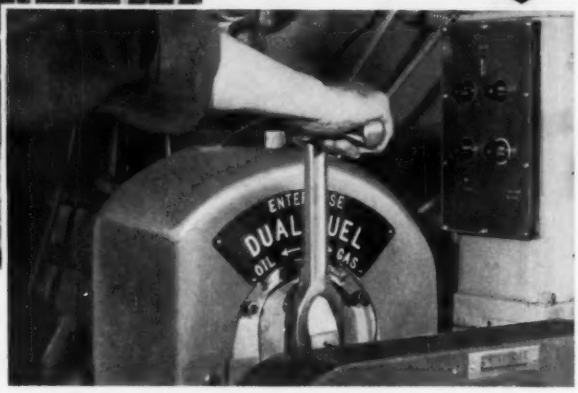


WORTHINGTON

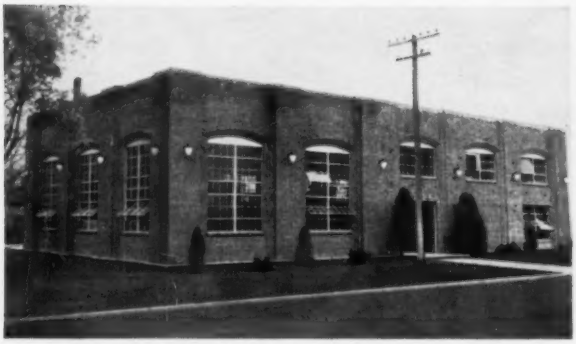


The two Enterprise Diesels were equipped for "Select-O-Matic" Dual Fuel operation in the field after installation, taking full advantage of low-cost gas for fuel.

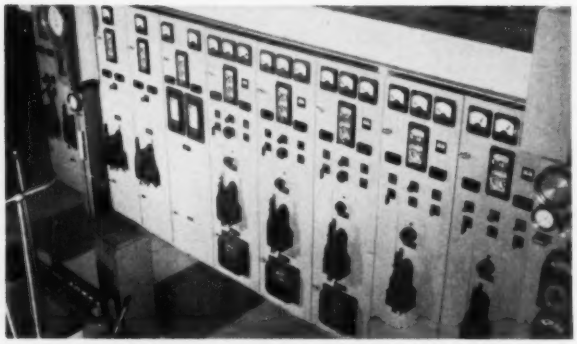
A single lever simplifies fuel selection. After manual setting, any fluctuation in gas pressure is compensated for automatically, thereby maintaining constant engine speed and load.



City of Broken Bow, Nebraska, Switches to Enterprise Dual Fuel—Saves $36,000 a Year!



Broken Bow's model municipal utility plant is under the capable supervision of L. E. Clark. *"These Enterprise Engines have given us exceptional performance in every way,"* says Clark, *"we're more than satisfied with their excellent record."*



Modern control panel keeps tab on plant production. A unique "Metered Maintenance" plan developed by Mr. Clark keeps operating and maintenance costs at a minimum.

Electricity comes cheap at Broken Bow, Nebraska, where two Enterprise "Select-O-Matic"® Dual Fuel Engines, running on natural gas with pilot oil, have cut $100 a day in fuel costs since their installation three years ago. Because of their low cost operation, they have virtually replaced the three original engines, which are now used for standby and peak load service only.

Intercooling boosts output. Even though Broken Bow's summer and winter temperatures vary greatly, the Enterprise Engines, through Intercooling, run at full load with no increase in temperatures or pressures. The result is greater KW output and economy.

The real payoff has been in greatly reduced electric rates, and a modern, dependable power plant that has paid for itself and is contributing to the general improvement fund.

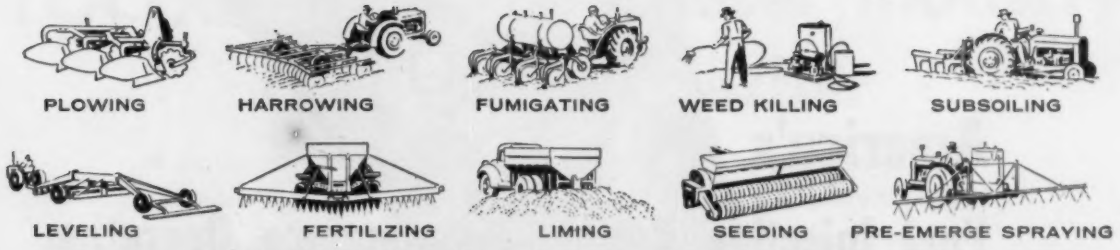
Get full information on Enterprise Engines today. Units from 73 to 7703 HP in Diesel, Dual Fuel, Tri-Fuel, Spark Ignited Gas—for every stationary, municipal, and marine use.

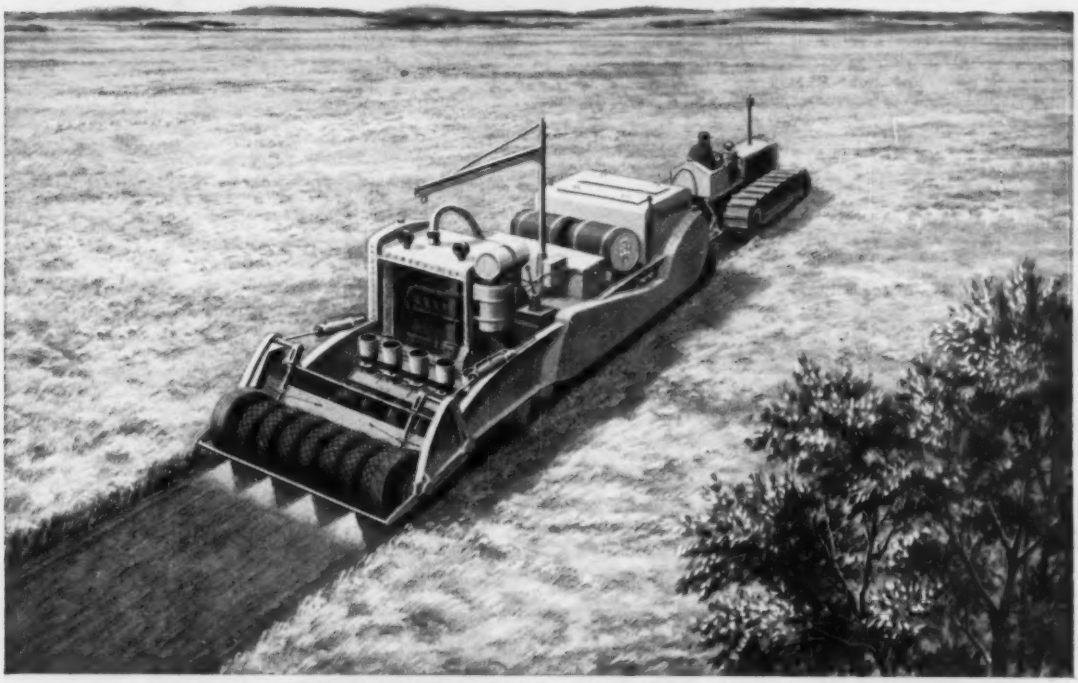
Over a million horsepower at work the world over!

ENTERPRISE
dependable **ENGINES**

ENTERPRISE ENGINE & MACHINERY CO.
Subsidiary of General Metals Corporation
18th and Florida Streets, San Francisco 10, California
Export Department, San Francisco

Boston • Chicago • Des Moines • Fort Worth • Huntington • Jacksonville • Kansas City • Los Angeles
New Orleans • New York • Pittsburgh • San Diego • Seattle • St. Louis • Washington, D.C.





SHELL RIMULA OIL selected for crankcase lubrication by

WONSOVER

ONE machine designed to do 10 Farm Jobs at once!

Wonsover, a new multi-purpose agricultural machine, is designed to eliminate individual farm operations. It performs many time-consuming jobs simultaneously. Wonsover is said to perform many multi-farming operations in just one sweep.

Norton-Portland Corporation at Portland, Maine, the manufacturers of Wonsover, selected Rimula* Oil as the recommended crankcase lubricant for maximum performance. Here are several reasons Wonsover chose this lubricant:

1. Shell Rimula Oil eliminates cylinder and bearing pitting caused by acid residue from incomplete combustion and low jacket temperature.

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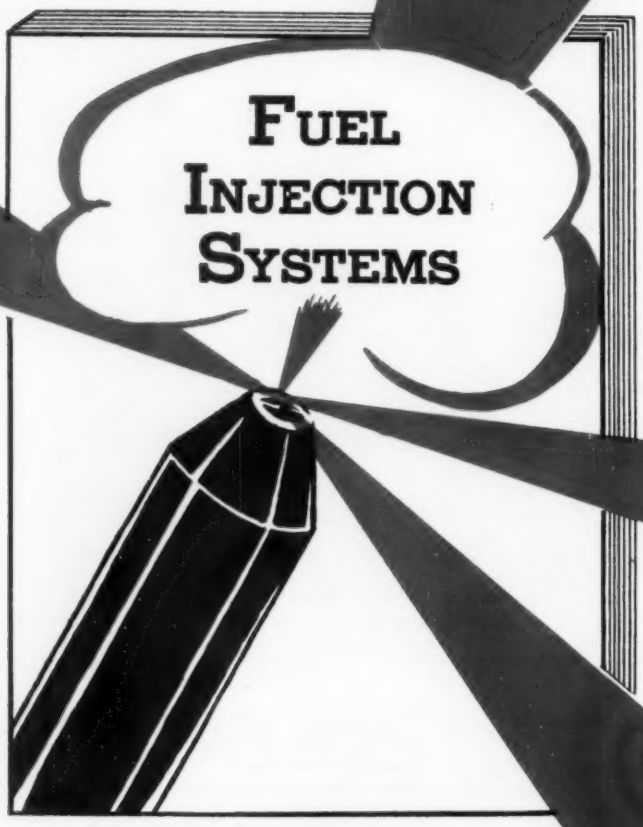

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Suddenly, we're not lonely. For some years now we have been calling the shots as we saw them—sort of acting like the conscience of the industry. It's not a practice calculated to make everyone your friend, in fact, when and where the "shoe fits", you can be darned unpopular. But you keep on prodding tender areas because that's part of the job. If you believe in an industry and sincerely want to promote its best interests, you have to say what you think needs saying. Any business paper worth a damn does this. Honest editors are working for betterment of their industries, not to win popularity contests or to try and please everyone at all costs. So once in a while you feel obliged to start prodding. First comes the "questioning" period. You talk to people to get all the angles; you sound out opinion. Then comes the lonely part—it's your decision as to whether or not to go ahead. That's when you'd like some positive confirmation; otherwise you have to wait until you hear an "Ouch". So we are glad to print Mr Rankin's comments in this issue. It shows that we are not alone in some of our expressed thoughts about the industry. Only a few months back we spoke of the need for a strong industry association—as an arbiter and objective promoter of the whole industry. This implies the needed unity of which Mr. Rankin speaks.
We'll shut up now and let you turn to the article entitled "Let's Stop Our Fighting!" And when you get through, think about it, and more important, do something about it.

B P E

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highlights

A report from England reveals that 99% of Fordson Major tractors produced in 1956 were equipped with diesel engines. Low cost is responsible for this almost complete swing-over to diesel for agricultural tractor power. These tractors are marketed here. In addition, Ford (Detroit) is expected to soon get into production on a new diesel design.

International Harvester observed its 50th anniversary of motor truck production on April 4. Earliest I-H models were designed for transport of farmers' produce to market. Now the line of motor trucks is expanded to virtually the most complete in the world.

The construction industry claims to be the nation's largest single production activity. It accounts for one dollar in every seven spent on all goods and services produced in the country each year. Construction is responsible, Associated General Contractors report, for about 14% of total employment in non-agricultural firms. Yes, construction is big business and the diesel industry has a big part in that production picture.

Electronic brains will mastermind complex Army transport when Stanford University winds up a $324,000 research contract just awarded. Gayton E. Germane is directing the project for plan and control of materiel movements. In turn, the results of this move by the Army should spearhead a like drive to coordinate all efforts of the transportation industry. Such cooperation by all in the field is needed to relieve the chronic headache of high transportation costs.

Engineers at Baldwin-Lima-Hamilton Corp. have the green light to develop a new all-purpose, low-gravity, 1800-hp locomotive for freight service. The go-ahead was given because of the successful record racked up by N. Y. Central's 11 ft high "Xplorer" during 125,000 miles of operation on the Cleveland-Cincinnati run. The unusually lightweight B-L-H locomotive is powered by a Maybach 12-cyl propulsion engine driving through a torque converter hydraulic transmission rather than by electric traction motors. This German-built diesel, serving as the prototype for the new freight model, is rated 1000 hp at 1500 rpm.

How much horsepower for tomorrow's trucks? There is a tip-off in the "Eaton Engineering Forum" for February, 1957. When planning for a new dynamometer to test heavy duty axle designs, they concluded that ". . . to be a useful tool in years to come, . . . a rating approaching 1000 horsepower" would be needed and that ". . . the torque equivalent of this rating should be available through a wide speed range . . ."

Box score on Class I locomotives just issued by the Association of American Railroads reveals, along with detailed statistics, these totals: 26,296 diesel-electric A and B locomotives units are now owned with 785 units currently on order. These healthy figures compare with 3,527 A and B steam locomotive units owned and one on order, and 519 electric units in service with orders placed for two locomotives.

Every year, $400 million worth of trucks and trailers are bought. Available credit plans often fail to span the 4 to 8 year useful life of such equipment. To finance these purchases, the American Trucking Association is investigating setting up its own credit agency. This study is being spurred on by the current tight credit situation. An 85-man team is busy probing ways and means to satisfy the credit needs of the industry.

Who says men don't want to learn! Back in Diesel Power, Jan., 1957, some details of the Society of Diesel Maintenance Engineers were given. Now we get a letter from Lurelle L. Albert, a heavy equipment mechanic in Clatonia, Nebraska. It's 90 miles to Milford, Neb., but since the Society started its educational program, he's missed only one meeting. Give such men the chance to learn; they'll do the rest.

Wondering how long you'll be able to fill that fuel tank? The API has good news. Substantial increases in this nation's reserves of crude oil, natural gas liquids and natural gas were chalked up again last year—despite all-time high production and consumption levels. However, the American Petroleum Institute notes that though the crude oil report is generally good, 1956 was the fourth consecutive year annual additions to proved reserves declined.

Let's Stop Our Fighting!

Probing some industry sore spots, the author is frankly critical but constructively so since he also suggests corrective action to promote a bigger and better industry.

by **R. A. Rankin,** Sales Manager
Chicago Pneumatic Tool Co.

EVERY media of communication—radio, television, newspapers, popular magazines, pamphlets, etc.—all direct public attention to atomic power plants, gas turbines, free-piston engines, superheated steam installations and new hydraulic power developments. In all the furor about these new, glamorous and dramatic developments, the staid and proven diesel, dual-fuel and gas-burning engines are relegated into the background.

As a result of this ballyhoo, the vital contributions to our economy of these workhorses are very often forgotten.

At times, even competent consulting engineers are blinded by the glamour wrapped around the highly-publicized forms of power. It even gets to the point where they are inadvisedly recommending to their clients installations of these units, whereas, economically, diesel, dual-fuel or gas engines are the proper prime movers for the service required.

A recent illustration of this point occurred when a prominent consulting engineer recommended a steam plant for an important defense installation. Thanks to the aggressive sales policy of a major diesel engine manufacturer, it was proven that the consulting engineer's recommendation would penalize the already overburdened taxpayer several thousand dollars a year in operating cost when compared with a diesel installation.

This is typical of how our government, foreign governments, and both our domestic and foreign industry to whom we might sell our products are often severely penalized. Frequently, consulting engineers have, unintentionally, made faulty recommendations based on information given to them by aggressive and not always unbiased salesmen rather than on an impartial and well-engineered appraisal of the particular problem involved.

The fault lies, not in the consulting engineer, but rather in the diesel industry itself. Too much energy of this entire industry is spent in fighting each other, rather than in the promotion of its product. If this energy could be spent in creating greater awareness of the general excellence of our industry's product—its dependability, its flexibility and its low-cost performance—there would exist a better basis for proper prime mover selection. We would all benefit.

The cry today is for engineers—more and better engineers. Yet the diesel industry can boast of both experienced and aggressive engineering on a par with almost any industry in our country today. Too frequently, the full impact on the general power field of this generally high level of engineering is dissipated by internal bickering, unethical practices, strife and lack of cooperation within the industry itself.

When selling, the *industry* as well as the particular make of engine should be sold. Tear down competitors unfairly and you tear down the industry. Yet in contrast to very deplorable and non-objective sales practices, the research and development aspect of our industry has been astounding.

Package units are now available, remotely controlled, automatically synchronized, and equipped with timing mechanisms to automatically start up and shut down at predetermined hours of the day. These are and should be a boon to public and private power companies, municipalities and industrials, all faced with peak load periods of operation. Also, they all face rising costs.

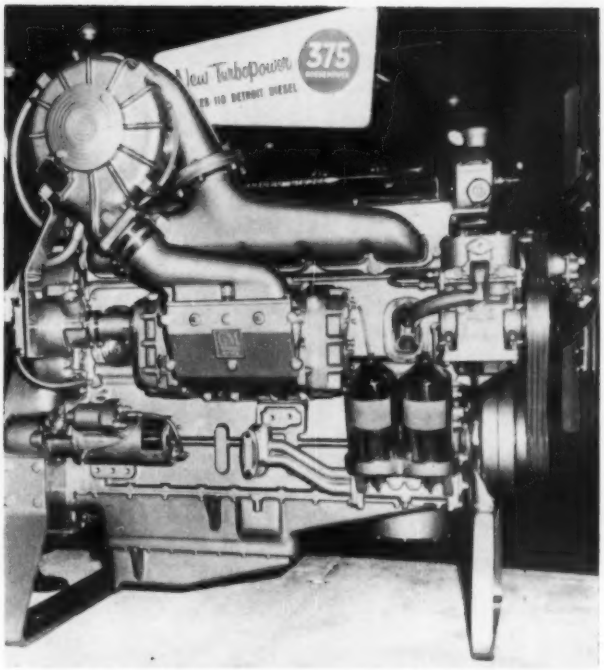
The development of higher bmep, higher speed, lighter weight, lower cost dependable engines have made it possible for the user to install economical power equipment at materially lower cost per horsepower, a very vital factor in the present tight money market.

The coordination of the industry in developing a unified recommendation of the equipment required for operation of engines on residual fuel is typical of what can be done by unified effort. The potentiality of producing lower cost power gives the whole industry a lift. And none of the more widely-publicized and glamorized power units can hope to obtain such results in small and medium size installations.

It is high time that the diesel and gas engine industry reviewed its past activities and realigned its policies toward a more cooperative approach to the problems of the industry. We need a more effective pooling of valuable sales and engineering data and a more constructive advertising and promotional program if our industry expects to get its truly outstanding story across and to retain its rightful position in the field of power prime movers.

GM "110" Uprated By Turbocharging

Turbocharger-blower combination boosts GM's "110" diesel horsepower 25%, increases efficiency and improves performance.



Detroit Diesel's 375-hp turbocharged Series "110" engine uses a turbocharger in conjunction with a Roots-type blower. This 6-cyl engine was developed for equipment needing a light-weight, high power output unit.

TURBOCHARGING has uprated the GM, 6-cyl, Series "110" diesel another 25%—this time from 300 to 375 hp. This engine recently had its output increased to 300 hp when a positive displacement Roots-type blower replaced the centrifugal blower formerly used. Now, a turbocharger in addition to the blower has increased it's horsepower even further.

According to Mr. Hunter, General Sales Mgr. of the Detroit Diesel Engine Div. of GM, this increase is obtained with no appreciable increase in bulk, weight or fuel consumption. The exhaust-driven turbine driving an air impeller works with the blower to increase the fresh air supply to the cylinders. The result is improved combustion, greater efficiency and better high-altitude performance.

The new engine was announced at the ARBA Road Show in Chicago. It will power off-highway earthmoving vehicles, scrapers and other equipment requiring a comparatively small, light-weight unit of high-power output.

The new engine features four accessory drive outlets on the rear of the engine, and four fan mounting positions on the front cover. Both a hydraulic pump and an air compressor can be direct driven off this engine at the same time.

The Roots-type blower delivers the same amount of air as the former centrifugal blower at top engine speed. At 800 rpm the new blower delivers an extra 40 cu ft of air per minute for better scavenging and improved combustion.

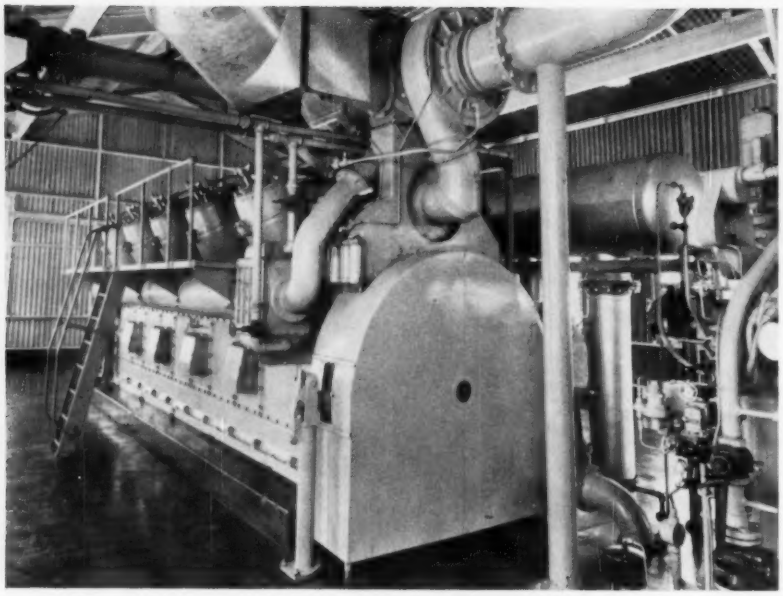
Uniflow scavenging with the new blower and turbocharger makes the "110" a more compact engine. It's shorter and lower. It saves space and is much easier to install and to service.

The blower can be mounted on either side of the engine to meet installation requirements. Only one cylinder block is used regardless of blower location. The engine is available with either left or right-hand rotation.

One design improvement in the Series "110" engine is a new cylinder head. It has an integral water manifold that eliminates studs and gaskets. Lubrication of rocker arms without outside lines is provided through drilled passages in the new head. Greater rigidity is achieved by a rail running around the outside of the head providing a better method of mounting the simple fuel manifold system.

A simplified mechanical governor is patterned after that used on the Series "71" engines and includes a tachometer drive. An accessory drive may also be taken off the governor drive gear. The governor is in a new position that allows rod connections to provide more rapid response to the governor.

Development of higher powered engines is especially important today, according to Mr. Hunter. This is in view of the nation's road building program and the need to hold down construction costs. With the additional horsepower in Detroit Diesel's new engine, one man driving a road scraper could do proportionately more work without adding to labor costs.



Cooper-Bessemer's GMVA-10, 1800-hp engine-compressor located at the Pegasus Station of Magnolia Petroleum Co. Turbocharger at upper right discharges air to gear-driven second-stage centrifugal blower right under it. Aftercooler is mounted on lower left-hand side of this series turbocharged engine.

Getting More Power For Less Fuel

Cooper-Bessemer's latest developments in both 2-cycle and 4-cycle turbocharging are described. Higher outputs per cylinder, lower fuel rates, better altitude performance, all in a smaller package, are the results.

TODAY's incentive for increased fuel efficiency and higher output per cylinder can be summed up in a single word—economics. When fuels were cheap (remember?) an improvement in fuel consumption often brought the comment, "So what?" And costs for plant, foundations, piping and all the rest of the installation were not at the rarified levels that they are today.

Dependability and minimum maintenance cost were prime virtues and still are. But today's engine buyers also want the lowest "Btu per hp hr" performance that they can get. Plus this, they'll want a lot of horsepower in a small package. Chances are that it must go on the foundation of an earlier engine of half its horsepower.

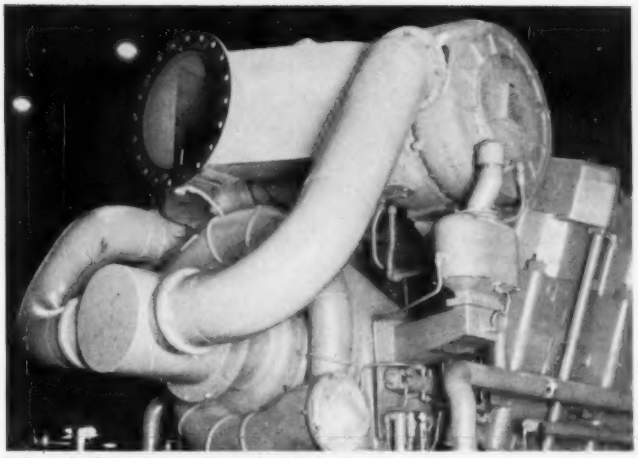
While this is true of all engines, it is shown dramatically in the case of natural gas engines. Ralph Boyer, vice president and engineering director of Cooper-Bessemer recently traced these developments in a conference at Cooper-Bessemer's Mount Vernon, Ohio, plant. This was occasion for announcement of two new turbocharging developments—one for 2-cycle engines and the other for 4-cycle units. Before getting into these, some background is in order.

Technological Breakthroughs

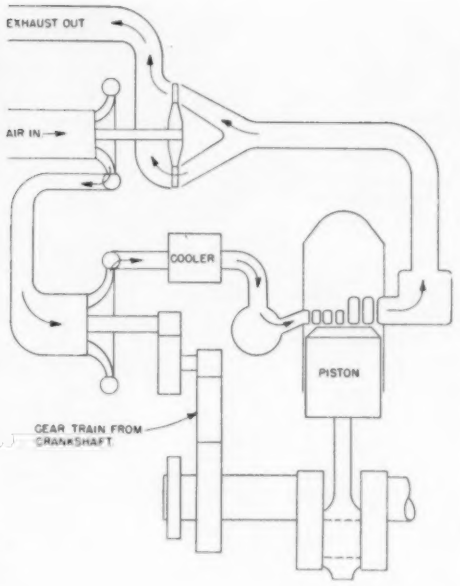
Getting back to the cheap fuel days, there was little incentive to save gas. Compression ratios were down around 6 to 1 which used a chemically-perfect gas-air ratio thought to be necessary for this type engine. Gas was introduced with the intake air and if some was lost through the exhaust porting, so what?

When the idea of timing gas injection with a valve was dreamed up, fuel consumption improved. Gas entered the combustion chamber after the exhaust ports were closed and waste to the exhaust was eliminated. Distribution to the cylinders was also improved. Gas engines now moved up on the efficiency curve.

Someone then found out that the engine didn't care about chemically-perfect gas-air mixtures; it had never



Twin turbochargers, one for each cylinder bank, discharge air to gear driven centrifugal blower of C-B's 2-cycle GMWC engine-compressor unit, rated 3500 hp at 250 rpm. Whole series system is mounted at flywheel end.



Schematic diagram of series turbocharging of 2-cycle loop-scavenged engine. Turbocharger at upper left is driven by exhaust gas. Discharged air enters blower driven from crankshaft by a gear train.

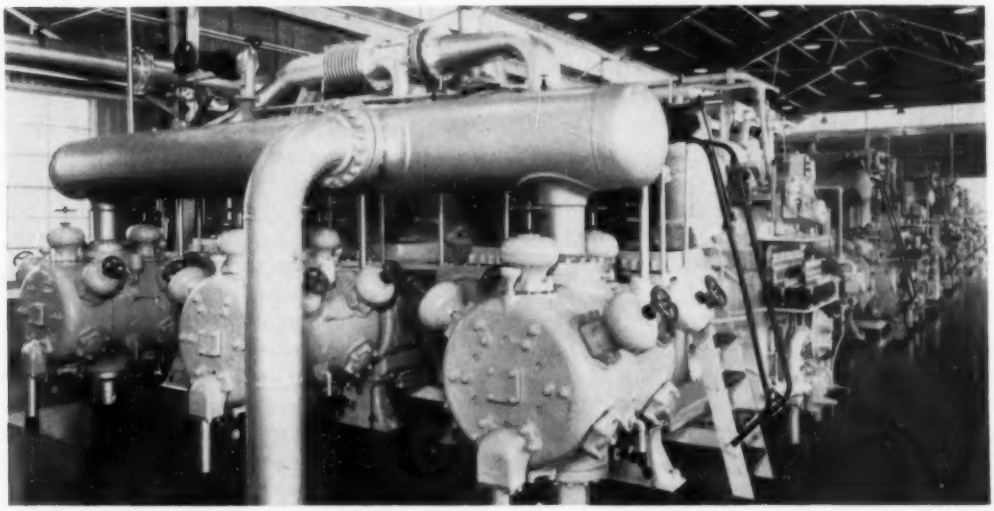
been to engineering school. This opened the way for leaner mixtures and by raising the critical compression ratio, permitted higher compression ratios. Another jump in efficiency resulted.

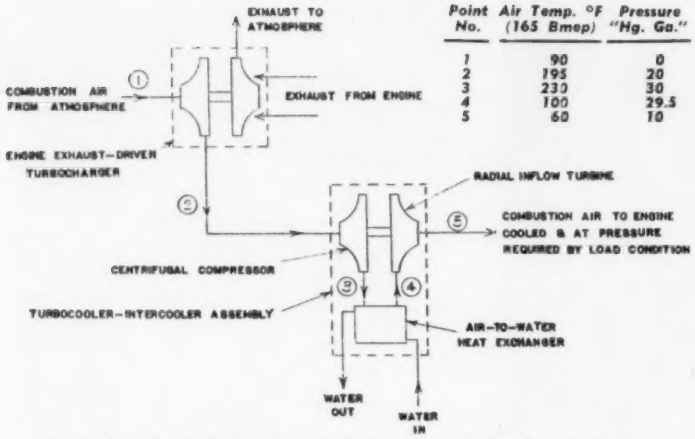
We're skipping all the details of engine and accessory development—particularly in ignition methods—that implemented the basic ideas. But there were plenty. Each step improved both efficiency and power output per cylinder.

The next big jump was supercharging—mechanical for 2-cycle engines and turbocharging for 4-cycle units. The low level of energy in the 2-cycle engine exhaust and the relatively low efficiency of contemporary turbochargers were a bar to 2-cycle turbocharging. But that's now changed.

Turbocharged 2- and 4-cycle gas engines are now operating at high compression ratios. Horsepower output is the same as for diesels and the fuel efficiency even better in many cases. So this brings us to Cooper-Bessemer's new turbocharging developments.

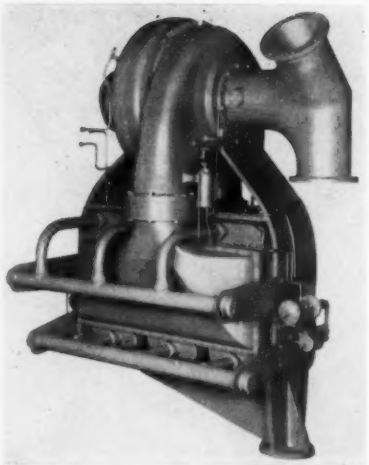
Eight 2-cycle C-B Model GMV engine-compressors in Cambridge Station of Tennessee Gas Transmission Co. demonstrate that 2-cycle, self-sustained turbocharging is practical. Series turbocharging, however, demonstrated additional advantages.





Point No.	Air Temp. °F (165 Bmep)	Pressure "Hg. Ga."
1	90	0
2	195	20
3	230	30
4	100	29.5
5	60	10

In "Turbocooling", air is compressed in two stages. Following water-cooling, air is expanded for further cooling. Expansion energy drives second stage.



Turbocooler exterior with compressor-expander at top with water-cooled heat exchanger below.

Two-Cycle Series Turbocharging

At one time it was categorically believed that 2-cycle engines would never be turbocharged; the energy level in its exhaust was too low. But economic incentives are a sharp spur. Better utilization of the exhaust energy through improved turbocharger efficiency and better matching of engine systems upset this engineering applecart.

Late in 1953, Cooper-Bessemer had a 2-cycle engine equipped with an all-exhaust driven turbocharger in full operation for the Tennessee Gas Transmission Company. The unit started and was self-sustaining at all loads; there was no mechanical connection to the engine.

The turbocharger, developed and built by Cooper-Bessemer, worked on the "blow-down" principle in contrast to "constant pressure" types because the system improved starting and low-load characteristics. Power of this Type GMV unit was boosted from 1100 to 1350 hp and it has pulled as high as 1500 hp in gas transmission service.

At the same time, increased engine output was being sought by the mechanical blower route. A highly refined gear-driven centrifugal blower was applied to the same type engine and designated Type GMVA. Power and fuel efficiency of these units parallel that of the turbocharged units.

Combination of the two systems was a logical step along the path of getting still higher outputs and efficiency. With the turbocharger relieved of the starting problem, a constant-pressure system could be used. A schematic diagram of this system is shown.

Note that the air out of the centrifugal blower passed through an aftercooler. This cooling is necessary after the two stages of compression, particularly when high ambient temperatures prevail. By reducing the temperature, air density is increased and a greater weight of air is trapped in the cylinder. This cooling is also helpful in controlling detonation at the high compression ratios used.

Compared with 2-cycle engines of only nine years before, output per cylinder was nearly doubled for the same bore, stroke and engine speed. Compared to more recent engines, horsepower has been increased nearly 40%. For larger engines, fuel economics as low as 6900 Btu per bhp hr can now be guaranteed.

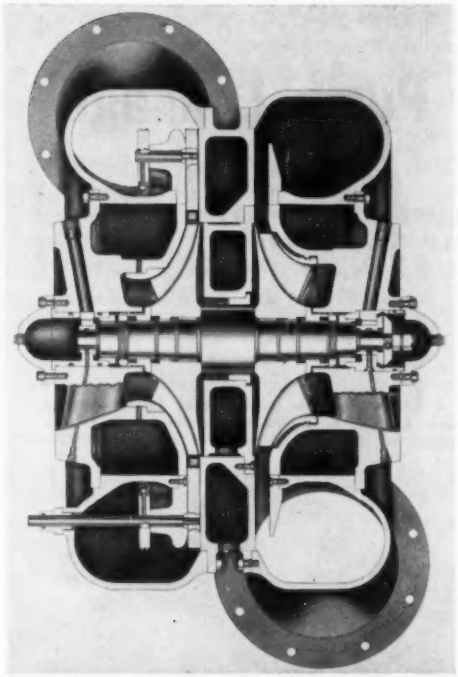
Another advantage of turbocharging in general has been the ability to sustain power output at higher altitudes. Normally-aspirated engines are derated at elevations above 1500 ft. Now, with this series turbocharging system, Cooper-Bessemer can match the characteristics of the components to sustain sea level ratings at any given altitude up to 7500 ft.

With pipe lines running all over the countryside, this is important. This is one reason why the series turbocharging system has been applied first to two series of vee-angle compressor units with another series expected to be available later in the year. These are the 18-in. by 20-in. GMWC units in horsepowers from 2000 to 3500, and the 14-in. by 14-in. GMVC models from 720 to 1800 hp. The 9¾-in. by 10½-in. GMXC units are on their way.

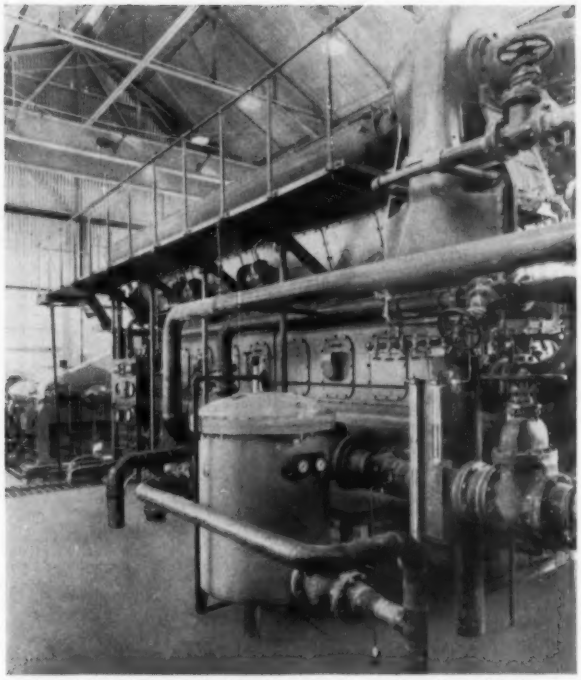
Four-Cycle Turbocharging and the Turbocooler

Turbocharging of 4-cycle engines, while generally a simpler job for the designer than with the 2-cycle units, presents its own problems. With half the power strokes of the 2-cycle models, it compensates with higher cylinder pressures and temperatures. Energy level in the exhaust is always sufficiently high for easy starting and self-sustained operation at all loads.

Temperatures are a problem. Bmep's have gone up from a modest 110-120 psi to the 165-185-psi range. Mean cycle temperatures have also increased and the thermal loading on pistons, valves, etc. has gotten into the range where something has to be done. Fortunately, turbocharging has its built-in cooling feature. This means that



Cross-section of the AT-13 Turbocooler showing details of construction. At left is compressor that is driven by energy released in the air expansion unit at left.



Actual installation of Turbocooler system on a 4-cycle engine shows the general arrangement and the relative size of Turbocooler unit.

power increases have gone up at a faster rate than the temperature loading.

But now the demand is for higher output per cylinder. Materials with higher corrosion and temperature resistance have been used but there is a limit to the commercial practicality of this approach. Bigger dividends are paid by providing cooler intake air. Internal cooling is increased and charge density is higher.

Enter the "Turbocooler". Look at the schematic diagram of the system. The first stage is a conventional turbocharger; the second, the turbocooler. After going through two stages of compression the air is at a relatively high temperature and at a much higher pressure than is required by the engine.

Considerable cooling takes place in the heat exchanger. A major factor in this is the high temperature differential that exists between the air and the cooling water. This also permits a relatively small heat exchanger to be used.

The intake air is now put to work. Its pressure is higher than needed so it is expanded through the turbine. This provides the energy for driving the second-stage compressor. And since the heat energy in the air is converted to work, the bottom drops out of its temperature.

So relatively cold air at an adequate supercharging pressure enters the engine. Cooling is very effective during the scavenging period and the trapped charge air has high density. More fuel can be burned and higher pressures obtained without the thermal loading exceeding the temperatures that the metals can stand.

Engineers will be quick to point out that there are inherent power losses in this combustion air system. True, but this loss builds up at a much slower rate than does the gain in the cylinder. And it's what happens in the cylinder that counts.

Since Cooper-Bessemer has both the know-how and the facilities to build their own rotating machinery of this type, components are matched for new production engines and for conversion of existing engines. Several such conversions as well as new engines are currently at work in pipeline pumping service.

As in the case of the 2-cycle turbocharged engines, tailoring of the combustion air system will sustain sea level ratings at high altitude. In fact, the 4-cycle engines appear to be limited in this regard only by the permissable turbocharger rotor speeds.

Also, like in the 2-cycle aftercooled system, the lower intake temperatures are helpful in controlling detonation in gas engines. Incidently, this turbocooler system is equally effective in achieving high outputs when liquid fuels are used as in diesel operation.

In Conclusion

Here are two ways in which one company is improving the efficiency and versatility of their engines. Others are using different approaches to achieve the same goal. As long as this intensive research continues and engines are provided that meet the users' requirements—both as to performance and economy—there'll be a good market for them. Thermal efficiencies of over 40% *can't* be overlooked.

Field Fixes For Injection Pump Leakage

International Harvester's recommendations for handling fuel leakage in Model "B" injection pumps if it should occur.

Fig. 1. Use bottom gasket as a template. Punch-mark the hole location near the inner edge of the gasket slot. In this case the hole has been already drilled.

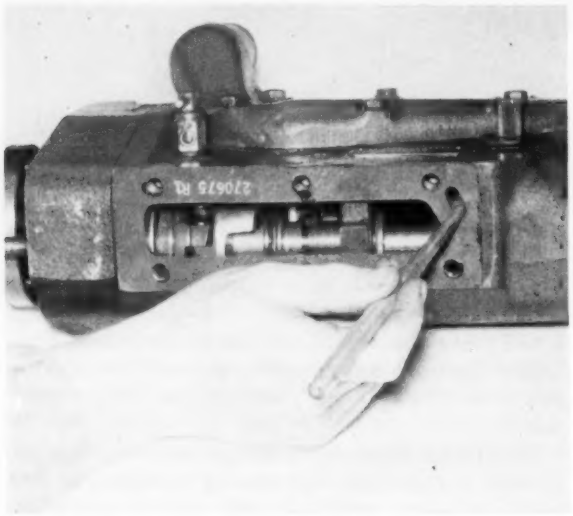


Fig. 2. A 3/16-in. hole is drilled about ½-in. deep up into pump housing to intersect distributor return line. Arrow points to the exact location of return line plug.

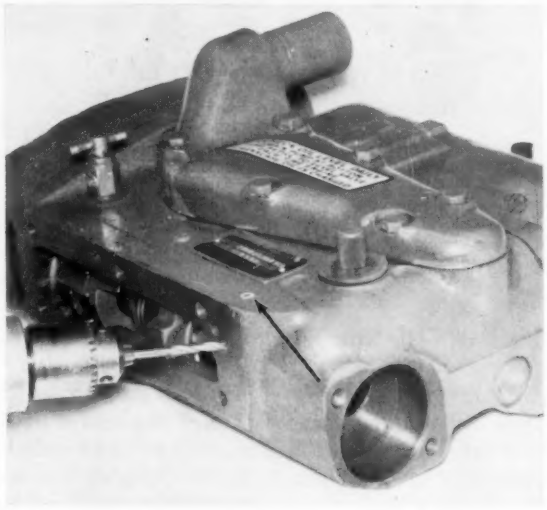


Fig. 3 Metal chips are flushed out by squirting oil through this hole in the rear of the pump housing. This hole is then plugged by using a dowel pin, set screw, or solid gasket.

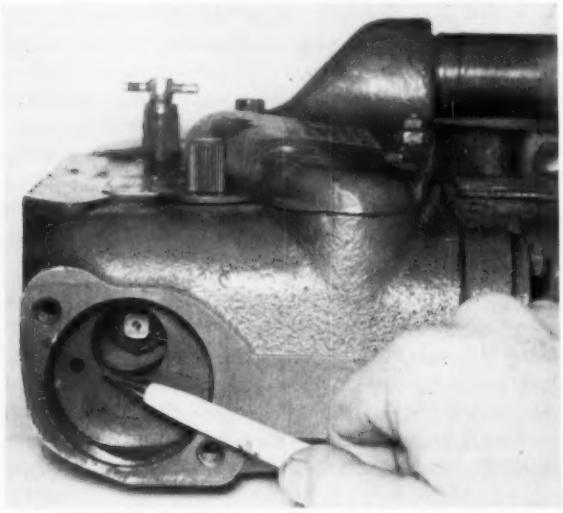
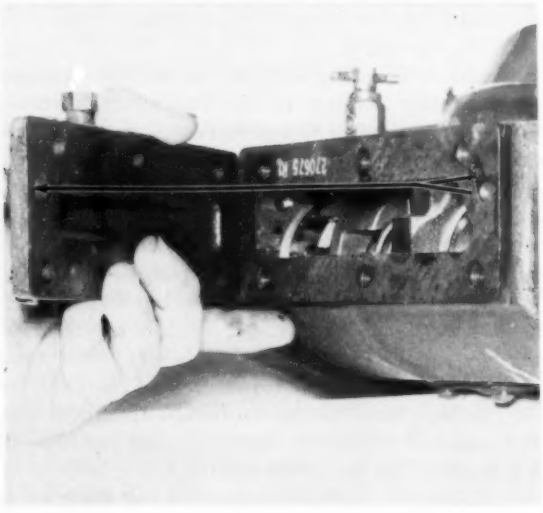


Fig. 4. Leakage fuel from the distributor valves as well as leakage from the plunger drains out from the original fitting in the bottom plate of the pump as indicated by the arrow.



SEVERAL important changes were made when the earlier International Harvester injection pump was modified to the "B" Type now in use. Rubber O-rings now seal around the pump distributor valve tappets and limit fuel leakage into the pump base.

Use of these O-rings permitted elimination of the scavenging pump and scavenging valve formerly necessary. The function of the scavenging pump and valve was to keep the pump passageways clear of leakage fuel and prevent flow back from the fuel tank when the engine was stopped. These, among other modifications were discussed in an article on the new "B" Type injection pump which appeared in the February 1956 issue of DIESEL POWER.

Should fuel leakage past the O-rings ever become excessive they can be replaced right in the shop. It is easy to replace these seals around the distributor valves on both the I-H single and twin-plunger injection pumps. Also, a new O-ring insert gasket is now available and the O-ring insert has been changed to accommodate it. Both can be ordered under the following part numbers: 270 666 R2 for the ring insert and 276 752 R1 for the ring insert gasket. The time required to install these O-ring insert gaskets is about four hours, and it is not necessary to disturb adjustments of pump settings.

The above change, however, is not absolutely necessary at once. It can be delayed generally until major work is done on the pump. In the meantime, small amounts of leakage fuel can be handled. This can be done by drilling a small hole and allowing the leakage fuel to drip on the ground as in injection pumps of other manufacturers.

Procedure

The following step-by-step procedure given by the I-H service section explains how you can do it yourself.

1. Remove the injection pump bottom plate. The injection pump must be removed from the engine on all units equipped with crankcase guards.
2. With the bottom gasket held in place, it can be used as a template for locating a new drilled hole. Punch mark the hole location (Fig 1) near the inner edge of the gasket slot.
3. Drill a 3/16-in. hole approximately 1/2-in. deep up into the pump housing. The hole should angle back 25 deg from vertical to intersect the distributor return line. The exact location of the return line is shown by the plug on the left side of the pump housing. (See arrow in Fig 2). Before drilling the hole, be certain to cover the bottom of the pump housing with masking tape or paper to prevent metal filings and dirt from getting into it.
4. Flush the chips out of the hole by squirting oil through the hole in the rear of the pump housing (Fig 3). Then plug this hole using a dowel, set screw or solid gasket.
5. Reinstall the primary pump and bottom plate. Leakage fuel from the distributor valves (Fig 4), and the plunger leakage will then drain out from the original fitting.

Dump Your Anti-Freeze

PREPARING your cooling system for hot weather duty is as essential as getting it ready for frigid weather. The important thing in this case is—drain that anti-freeze. Unless all winter worn anti-freezes are drained out, including the so-called "permanent" types, the result may be overheated engines or even more serious damage.

Here are a few spring maintenance tips from cooling system experts of the Du Pont Company. Follow them and they may help you to avoid expensive repair bills.

Corrosive anti-freeze solutions are a major cause of overheated engines. These solutions attack vital cooling system parts producing rust which clogs up the radiator and narrow water passages in the engine block. Overheating also can cause scored cylinders, warped heads, seized pistons, burned and sticky valves, etc.

Many troubles attributed to overheating are usually traced to a general misunderstanding of the word, "permanent" in anti-freeze. This really means winter-long—not year after year.

For example, all so-called "permanent" types can turn acid after one season's use. Air and exhaust gases seeping into the cooling system oxidize the glycol. As these acids form they are neutralized by rust inhibitors. But, in time the inhibitors become depleted leaving the solution corrosive. Thus, it is more economical in the long run to drain out and throw away the worn solution and put in fresh anti-freeze in the fall. Don't be misled by hydrometer readings which show that winter-worn solutions still give adequate protection against freezing. There is no way the hydrometer can simultaneously indicate if it has turned acid.

Adding fresh rust inhibitor to winter-worn solutions won't solve the corrosive problem. It temporarily slows up corrosive action, but can't eliminate acid salts present.

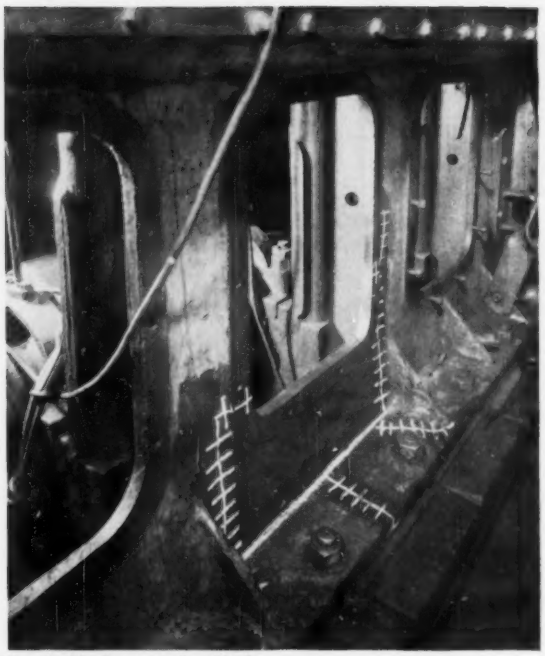
For safe, trouble-free operations, the National Bureau of Standards, construction authorities, and anti-freeze manufacturers recommend this program before hot weather begins:

1. Drain and discard winter-worn anti-freeze solutions from the radiator and block.

2. Clean and flush the cooling system using a chemical cleaner if necessary.

3. Check all cooling system parts for leaks or wear; replace or repair where necessary.

4. Refill radiator with fresh water and add a chemical rust inhibitor.



When the connecting rod hit the side of this large engine block the section around the inspection hole was extensively damaged. Without removal of the frame, a new section was hand-fitted, "Metalocked" and "Metalaced" to completely restore every detail.

Cold-Repairing Can Save It

Broken, cracked or weakened engine parts can often be saved. Cold-repairing, reinforcing, or rebuilding has been successful even on highly stressed parts.

YOU'VE broken or cracked an essential part of your engine—immediately questions begin to pop up. Can it be repaired? Can it be replaced? How long will the unit be out of service? Which is least expensive—to repair or replace? If it can be repaired—how? Will it last? How long will it take?

The answers to these questions determine what you will do. Weigh all the factors carefully. Only the specific conditions under which you must work will give you the clues.

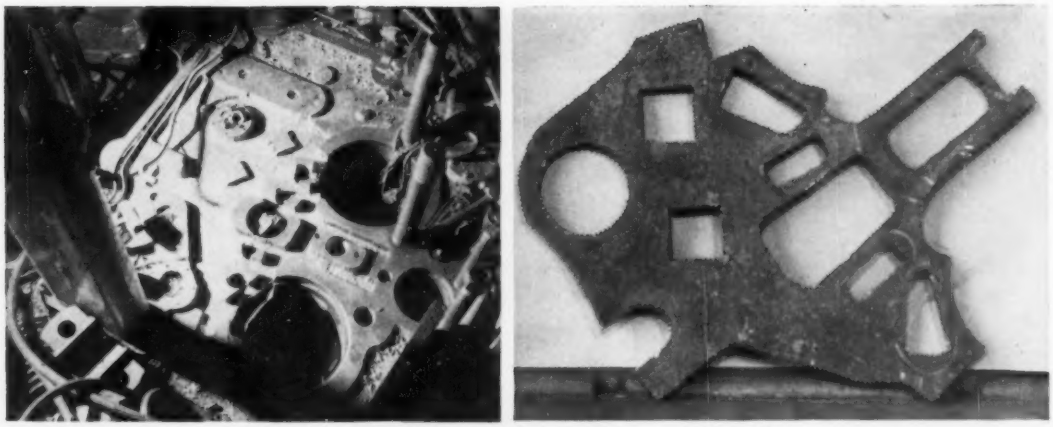
Assuming that you've decided in favor of repair, then other problems arise. What process will you use—welding or some form of cold repair? Can the part be repaired in place or must it be removed? If the part can be welded, what about the warpage, stresses, brittleness, misalignment and fire hazard that may result from it?

Even when some form of cold repair must be used a decision must be made. If a crack has to be sealed just to prevent leakage, simple lacing or sewing may do the trick. But if a weakened, cracked or broken part which is highly stressed must be repaired, reinforced, or entirely rebuilt, then you may have the opportunity of resorting to a process such as the "Metalock System" of repair.

Let us discuss this system which has been successfully used since 1936 when it was initiated by Mr. Lawrence Scott, of Metalock Repair Service, Inc. This company has shops in L. I. City, N. Y., Houston, Texas, Los Angeles, Calif. and Chicago, Ill.

Where Used

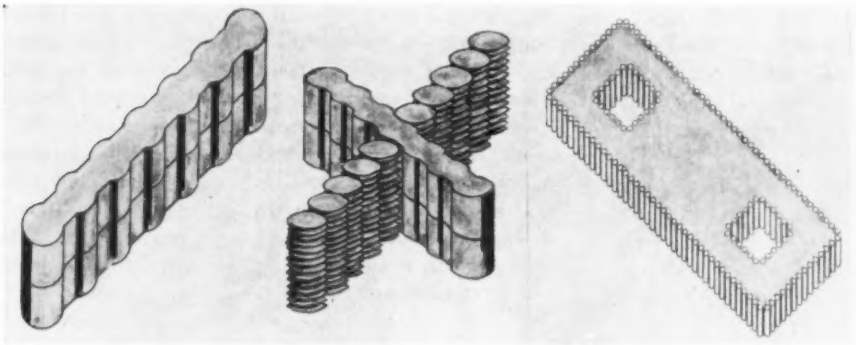
"Metalock" can be used to cold-repair any metal regardless of the length or depth of the damage according to Mr. Scott. Whole sections are removed and replaced if necessary. Original design is frequently altered. Even the most complicated jobs such as crankshaft repairs have taken only a short time to complete whereas a replacement would have taken months to arrive if it could be obtained at all.



Cylinder head badly damaged around valve ports, fuel injection valve, etc., is cold-repaired by use of "Interlock", "Metalock" and "Metalace". "Interlock" at right is finished and ready to be "Metalocked" and "Metalaced" around the head parent metal.

These lasting repairs are not only stronger and more dependable than the original part, but you get it at 10 to 25% of the replacement cost according to MRS, Inc. Owners have even been able to obtain insurance on the repaired crankshafts although in most cases these repairs are intended for temporary service in an emergency.

leakage. It is also used in conjunction with the locks to accomplish a pressure tight joint and give rigidity to all repairs. Holes are drilled and tapped then special studs or dowels are screwed in tangent to each other along the crack. These are then cold-worked to insure tightness and complete filling of the crack with new metal.



Diameter of "Metalocks" (at left) range from 1/8-in. to 5/16-in. They're cold-hammered into holes drilled across crack. "Metalace" (in center) range from 1/8 to 3/8-in. in diameter. They're screwed and cold-worked into holes drilled along crack. "Interlock" (at right) is a "Masterlock" with holes cut into the plate. Both the holes and plate conform to the shape of the parent metal. The "Interlock" is "Metalocked" and "Metalaced" to the parent metal of the damaged part.

Metalock Systems

There are four primary methods of doing this work. Their nomenclature more or less describes each one. They are called "Metalock," "Metalace," "Masterlock," and "Interlock." Each has variations. On most jobs a combination of two or more of these methods is used.

In "Metalock" a series of holes is drilled across the crack and the metal between the holes is broached out. This leaves a scalloped effect. A formed piece of nickel alloy steel is then placed in the space and cold hammered with an air tool to fill this drilled and broached section. More and more alloy is added and swedged until the space is completely filled. Depth of drilling and broaching depends on parent metal thickness.

"Metalace" is the system used to seal cracks against

Standard locks produce a minimum joint tensile strength of 20,000 psi. With other locking devices such as "Anchorlock," "Wedgelock," "Taperlock" and "Superlock" higher strength may be produced.

Diameter of the "Metalocks" range from 1/8 to 5/16-in. whereas that of the "Metalace" is from 1/8 to 3/8-in. The size used depends on the parent material, crack length and depth, parent metal condition, section design, operating conditions, casting thickness, pressures and stresses.

The locking metals having a low coefficiency of thermal expansion tend to tighten the joint in rising temperatures. These repairs tend to eliminate or upset stress concentrations in the parent metal and thereby improve the fatigue resistance of the part. Resistance to corrosion is obtained by locking materials of proper galvanic range.

Two cycle cylinder head shows cold-repairs made two years apart. Combination "Metalocking" and "Metalacing" at right made five years ago held while new cracks started. Similar repairs can be made on any parts at site or in MRS, Inc. shops.

A 50% break in this 19-in. diesel engine crankshaft was "Metalocked" and "Metalaced" in place successfully after welding had failed.

Variations

"Masterlock" is used for a great concentration of lock strength, a very wide distribution of working stress and the elimination of stress concentrations. The stress pattern in the parent metal is completely altered with this device and stresses are redistributed to areas not previously subjected to high stresses and fatigue.

The "Masterlock" and its variations such as "Masterplate," "Master Ring," "Master Rib," "Orificelock," "Interlock," "Flangelock," "Cornerlock," and "Deadlock" are used where the unit "Metalocks" and its variations are inadequate. These systems require removal of parent metal for installation, and the various locking elements are generally made of steel.

In "Masterlocking" an entire section is drilled and chipped out to a pre-determined depth and replaced with a piece of steel. This steel has its edges drilled and cut so that the entire plate contour is a continuous series of half holes. This plate is fitted into the cut out section of a cylinder head or engine block, for example, and, using the half holes in the plate as a guide, the casting is drilled to conform.

Pins are then driven into these matching half holes, cold hammered, and swedged. This compresses the cast iron and steel, thus wedging and fixing the plates rigidly to the cast iron directly across the crack. The swedging and peening of the pins, dowels and alloy metal not only sets these pieces firmly and securely. The resulting compression increases strength of the cast material.

The size and thickness of these plates is determined by getting enough tensile strength of steel to equal or better the strength of cast iron at that point. In some cases large or small sections may be completely replaced with dissimilar materials of the desired properties to overcome localized difficulties.

The "Master Ring," reinforces a circumferential boss. "Masterplate" is used to replace defective areas. "Master Rib" provides a gussett. "Orificelock" is designed to renew or reinforce a hole as in the case of a stud hole crack. "Flangelock" reinforces a flange. "Cornerlock" renews a corner boss. "Deadlock" is an external reinforcement.

"Interlock" is used to reinforce an edge. It is a "Masterlock" with holes cut into the plate. Parent metal is cut to conform to the shape of the "Interlock." These small *islands* of parent metal left protruding, fill the holes in the plate and give additional shear strength. The islands and the matching holes in the plate are also drilled, pinned and swedged similar to the outer contour of the lock. This type of repair is generally used in a weak casting to gain the support of the parent metal more efficiently.

All jobs are guaranteed although the length of guarantee varies with the type of equipment and service. Many jobs are so repaired that a broken section which has failed through poor designing it often redesigned and made stronger than it was originally. Similarly, worn sections can be strengthened back to the original or better.

Other Repair Methods Used

In addition to the above there are other repair systems used by MRS, Inc. These include "Metalaze" a new method of brazing requiring only limited amounts of local heat without preheat. It is used for a quick and economical repair on thin castings. "Weldlock," also used, is a combination of locking and brazing or welding. Still another process (proprietary) used is the building up of the crown and ring sections of aluminum pistons without preheating. Then the rough surface is machined.

Conclusion

Complexity of the "Metalock Systems" requires much attention for the many complicated applications. For this reason, only licensed and trained personnel are entrusted with the repairs. However, MRS, Inc. is working on a system whereby do-it-yourself kits may be feasable for certain repairs.

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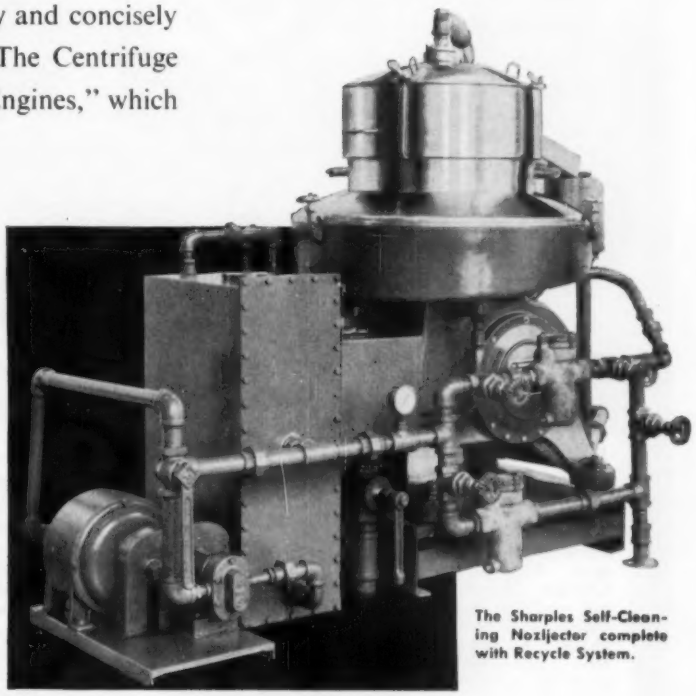
The facts are clearly and concisely stated in a technical report, "The Centrifuge and Residual Fuels for Diesel Engines," which we will gladly send you.



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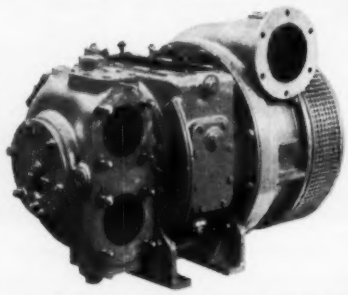

A typical Brown Boveri exhaust gas Turbo-Charger. These are available in various sizes for charged outputs from about 100 BHP to 6,000 BHP, 4- or 2-cycle operation.

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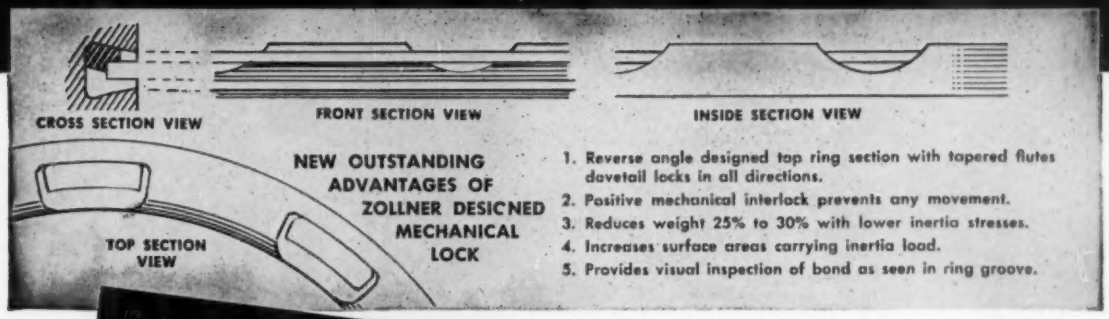
BOND-O-LOC* PISTONS

WITH "NI-RESIST" IRON TOP RING SECTION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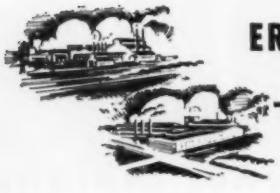

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Injector-sticking problem solved with Du Pont diesel fuel additives

A CASE HISTORY

A number of diesel tractor operators in one western farm area encountered frequent injector-sticking troubles. Downtime and maintenance costs mounted up.

One of the large fuel suppliers in the vicinity offered to help solve the problem. To get the benefit of an objective outside opinion, this fuel supplier also called in a Du Pont automotive fuel specialist. After careful study, the Du Pont man suggested the use of chemical additives in the fuel.

Following this recommendation, Du Pont Fuel Oil Additive No. 2 (FOA-2) and Du Pont Metal Deactivator (DMD) were added to the fuel as it left the refinery. To identify the fuel with the additives for test purposes, some dye was also added.

RESULTS

After using this fuel for two months, the tractor operators were interviewed. All reported that, where the additive-treated fuel was used, injector-sticking problems were nil.

It is because of results like these that many refiners now add FOA-2 and DMD to their diesel fuel before it leaves the refinery.

So, if you are encountering injector-sticking or filter-plugging problems in your diesel engines, we believe it will be to your advantage to try a fuel containing these two Du Pont additives.

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Caterpillar Tractor Co. S-3
Chicago Pneumatic Tool Co. S-3
Clark Brothers Co. S-4
Climax Engine & Pump Mfg. Co. S-4
Continental Motors Corp. S-4
Cooper-Bessemer Corp. S-4
Cummins Engine Co., Inc. S-5
Enterprise Engine & Machinery Co. S-5
Fairbanks, Morse & Co. S-6
Ford Motor Co., Ford Div. S-6
GM-Cleveland Diesel Div. S-6
GM-Detroit Diesel Engine Div. S-7
GM-Electro-Motive Div. S-7
Gray Marine Motor Co. S-7
Hallett Mfg. Co. S-7
Harnischefeger Corp., P&H Diesel Div. S-7
Hercules Motors Corp. S-8
Ingersoll-Rand Co. S-8
International Harvester Co. S-9
Kahlenberg Brothers Co. S-9
Lathrop Engine Div. Burmeister & Wain S-9
Le Roi Div.-Westinghouse S-9
Lufkin Foundry & Machine Co. S-10
Mack Trucks, Inc. S-10
Minneapolis-Moline Co. S-10
Murphy Diesel Co. S-10
Nordberg Mfg. Co. S-10
Oliver Corp. S-11
Rathbun-Jones Engineering Co. S-11
R. H. Sheppard Co., Inc. S-11
Sterling Engine Co. S-11
Union Diesel Engine Co. S-11
Venn Severin Engine Works, Inc. S-12
Waukesha Motor Co. S-12
White Diesel Engine Div., White Motor Co. S-12
White-Roth Machine Co. S-13
Witte Engine Works S-13
Worthington Corp. S-13

Foreign Diesel Engines Being Actively Sold in This Country

Armstrong Siddeley Motors Ltd. S-14
Burmeister and Wain American Corp. S-14
Gebr. Eicher Traktorenfabrik S-14
Henschel & Sohn S-14
Klockner-Humboldt-Deutz S-15
Lister-Blackstone S-15
M.A.K. S-15
M.A.N. S-16
D. Napier & Son, Ltd. S-16
Petter Engine Div. of Brush ABOE Inc. S-16
Sulzer Bros., Ltd. S-16

SYMBOL MEANINGS

Use

M—Marine propulsion service
S —Stationary service implying permanence of installation
P —Mobile, portable, or transportational service

Type

A—Diesel
B—Spark ignition natural gas engine
C—Diesel and dual-fuel
D—Diesel, dual-fuel, and natural gas engine

Starting System

A—Air starting
E—Electric starting
G—Gasoline engine starting
H—Hand cranking
HY—Hydrostarter

Fuel System

O—Own manufacture
B—American Bosch
S—Bendix-Scintilla
R—Roosa-Master
D—Demco
A—Adeco
C—CAV
G—Robert Bosch

Ignition

B—Battery system
LM—Low tension magneto
HM—High tension magneto
P—Pulse generator

Supercharging Systems

M—Mechanical
T—Turbocharger

Reverse Gears

D—Direct reversing
S —Snow-Nabstedt
T —Twin Disc
C—Capitol
W—Western Gear
P —Paragon
O—Own manufacture
F—Falk

Notes:
Model numbers are for basic engines and may vary for other ratings and uses.
Dimensions are given to the next largest inch.
Dimensions and weights are for basic model unless otherwise indicated.

Alco Products, Inc.
30 Church Street, New York, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-9 x 10¼	C	M-S-P	4	6	9 x 10¼	550-900	720-1000	B	....	E-A	T	W-F	136	60	98	22100
12-9 x 10¼	C	M-S-P	4	12	9 x 10¼	1100-1800	720-1000	B	....	E-A	T	*DH-F	158	61	110	32650
16-9 x 10¼	C	M-S-P	4	16	9 x 10¼	1470-2400	720-1000	B	....	E-A	T	*D-H	197	61	104	42000
6-12½ x 13	C	S-P	4	6	12½ x 13	580-660	600-740	B	....	E-A		....	156	60	82	34000†
6-12½ x 13T	C	S-P	4	6	12½ x 13	810-1000	600-740	B	....	E-A	T	....	156	60	115	36000†
8-12½ x 13	C	S	4	8	12½ x 13	775-860	600-720	B	....	A		....	200	60	96	49000
8-12½ x 13T	C	S	4	8	12½ x 13	1080-1300	600-720	B	....	A	T	....	225	60	115	50000

† *Dimensions and weight for portable unit.* *DeLaval-Hindmarch

Baldwin-Lima-Hamilton Corp.
Hamilton, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
606-NA	C	M-S	4	6	12¾ x 15½	430-750	360-625	B-S	....	A-E	....	D†	159	76	91	35000
608-NA	C	M-S	4	8	12¾ x 15½	575-1000	360-625	B-S	....	A-E	....	D†	195	76	91	43500
606-SC	C	M-S	4	6	12¾ x 15½	650-1320	360-625	B-S	....	A-E	T	D†	170	86	91	36500
608-SC	C	M-S	4	8	12¾ x 15½	865-1750	360-625	B-S	....	A-E	T	D†	212	89	91	45000
521-SA	A-C	M-S	2	5	21½ x 27½	2425-2800	257-277	B	....	A	....	D	267	80	161	175000
621-SA	A-C	M-S	2	6	21½ x 27½	2910-3360	257-277	B	....	A	....	D	304	80	161	205000
721-SA	A-C	M-S	2	7	21½ x 27½	3395-3920	257-277	B	....	A	....	D	341	80	161	233000
921-SA	A-C	M-S	2	8	21½ x 27½	3880-4480	257-277	B	....	A	....	D	378	80	161	262500
921-SA	A-C	M-S	2	9	21½ x 27½	4365-5040	257-277	B	....	A	....	D	415	80	161	292000
1021-SA	A-C	S	2	10	21½ x 27½	4850-5600	257-277	B	....	A	....	....	478	80	161	321000
1221-SA	A-C	S	2	12	21½ x 27½	5820-6720	257-277	B	....	A	....	....	552	80	161	380000
824-DA*	A	M-S	2	3	24 x 36	1585-3000	100-180	O	....	A	....	D	....	....	....	....
424-DA	A	M-S	2	4	24 x 36	2115-4000	100-180	O	....	A	....	D	310	111	236	....
524-DA	A	M-S	2	5	24 x 36	2640-5000	100-180	O	....	A	....	D	356	111	236	441000
624-DA	A	M-S	2	6	24 x 36	3170-6000	100-180	O	....	A	....	D	402	111	236	514000
724-DA	A	M-S	2	7	24 x 36	3700-7000	100-180	O	....	A	....	D	447	111	236	588000
824 DA	A	M-S	2	8	24 x 36	4225-8000	100-180	O	....	A	....	D	492	111	236	661000
924-DA	A	M-S	2	9	24 x 36	4750-9000	100-180	O	....	A	....	D	538	111	236	738000
1024-DA	A	M-S	2	10	24 x 36	5280-10000	100-180	O	....	A	....	D	583	111	236	808000

* *SA indicates single acting; DA indicates double acting.* *Weights are net for engine only.*
† *Straight Reduction Gear or Reverse Reduction Gear.*

The Buda Division
Allis-Chalmers Mfg. Co.
Harvey, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
2BD77	A	M-S-P	4	2	3¹⁵⁄₁₆ x 4½	13.4-15.8	1800-2000	B	....	E	....	S	22	23	31	500*
4DA153	A	M-S-P	4	4	3¹⁵⁄₁₆ x 4½	28-34	2000-2400	B	....	E	....	S	31	23	31	680*
6DA230	A	M-S-P	4	6	3¹⁵⁄₁₆ x 4½	42-60	2000-2400	B	....	E	....	S	39	23	31	850*
4DA182	A	M-S-P	4	4	3¾ x 4½	32-39	1800-2400	B	....	E	....	S	31	23	31	710*
6DA273	A	M-S-P	4	6	3¾ x 4½	50-65	1800-2400	B	....	E	....	S	39	23	31	890*
6DAM273	A	M	4	6	3¾ x 4½	85	2800	B	....	E	....	S	57	24	32	995
6DT317	A	M-S-P	4	6	3⅝ x 5⅜	56-79	1800-2300	B	....	E	....	S	42	28	41	1150*

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6DA779	A	S-P	4	6	5¼ x 6	120-165	1400-1900	B	....	E	....	....	59	30	49	2552*
6DA844	A	M-S-P	4	6	5¼ x 6½	140-190	1200-1950	B	....	E	....	S	59	30	49	2630*
6DAS844	A	M-S-P	4	6	5¼ x 6½	155-245	1400-1950	B	....	E	....	M	S	59	35	49	2674*
8DA1125	A	M-S-P	4	8	5¼ x 6½	171-250	1400-1950	B	....	E	....	....	S	76	30	51	3400*
8DAS1125	A	M-S-P	4	8	5¼ x 6½	192-300	1400-1950	B	....	E	....	M	S	78	34	51	3580*
6DA970	A	S-P	4	6	5⅝ x 6½	140-187	1400-1800	B	....	E	....	....	....	59	30	49	2600*
8DC1290	A	S-P	4	8	5⅝ x 6½	190-243	1400-1800	B	....	E	....	....	....	76	30	51	3450*
6DCB1879	A	M-S-P	4	6	6¾ x 8¾	171-245	900-1200	B	....	A-E	....	S	W	96	54	65	6925*
6DCS1879	A	M-P	4	6	6¾ x 8¾	284	1200	B	....	A-E	....	M	S	100	54	65	7900*
8DC2505	A	M-S	4	8	6¾ x 8¾	216-325	900-1200	B	....	A-E	....	....	W	149	52	92	12840**
8DCS2505	A	M-S	4	8	6¾ x 8¾	320-430	900-1200	B	....	A-E	....	M	W	158	64	92	13240**
4B153	B	S-P	4	4	3⅛ x 4½	41	2000	..	B-HM	E	....	....	....	51	23	39	780
4B182	B	S-P	4	4	3⅜ x 4½	46	2000	..	B-HM	E	....	....	....	51	23	39	780
6B230	B	S-P	4	6	3⅞ x 4½	57.5	2000	..	B-HM	E	....	....	....	57	23	39	960
6B273	B	S-P	4	6	3⅞ x 4½	69	2000	..	B-HM	E	....	....	....	57	23	39	960
HP326	B	S-P	4	6	3⅛ x 4¾	69	1800	..	B-HM	E	....	....	....	61	27	46	1164
HP351	B	S-P	4	6	3⅛ x 5½	74	1800	..	B-HM	E	....	....	....	61	27	46	1164
K428	B	S-P	4	6	4⅛ x 4¾	97	1800	..	B-HM	E	....	....	....	71	32	52	1810
L525	B	S-P	4	6	4½ x 5½	96	1600	..	B-HM	E	....	....	....	71	32	52	1860
LO525	B	S-P	4	6	4½ x 5½	118.5	1600	..	B-HM	E	....	....	....	73	30	53	2050
6MO893	B	S-P	4	6	5⅛ x 6	174	1400	..	B-HM	E-G	....	....	....	95	39	64	3815
6MO970	B	S-P	4	6	5⅛ x 6½	188	1400	..	B-HM	E-G	....	....	....	95	39	64	3830
8MO1290	B	S-P	4	8	5⅛ x 6½	261	1400	..	B-HM	E-G	....	....	....	111	46	74	5420
6PC1879	B	S-P	4	6	6¾ x 8¾	234	1000	..	B-HM	A-E-G	....	....	....	123	48	83	9100
8PC2505	B	S-P	4	8	6¾ x 8¾	362	1000	..	B-HM	A-E-G	....	....	....	141	64	93	12640
8PCS2505	B	S-P	4	8	6¾ x 8¾	440	1000	..	B-HM	A-E-G	M	....	....	150	64	88	14289

* *Weights and dimensions for portable units.* ** *Weights and dimensions for stationary units. All diesel engines have Lanova combustion system.*
1955 *Listings given.* 1956 *Data not available.*

Caterpillar Tractor Company
Peoria, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D-311	A	S-P	4	4	4 x 5	43.5	1800	O	....	E-G	....	....	58	28	53	1800
D-315	A	M-S-P	4	4	4½ x 5½	62	1800	O	....	E-G	....	T	59	30	49	2200
D-315G	A	S-P	4	4	4½ x 5½	80	1800	O	....	E-A	T	T	47	36	56	1985
D-318	A	M-S-P	4	6	4½ x 5½	90	1800	O	....	E-G	....	T	56	33	43	2770
D-318G	A	S-P	4	6	4½ x 5½	120	1800	O	....	E-A	T	T	61	37	51	2450
D-326F	A	M-S-P	4	6	5⅛ x 6½	137	1800	O	....	A-E-G	....	T	72	37	59	3550
D-337F	A	M-S-P	4	6	5⅛ x 6½	186	1800	O	....	A-E-G	T	O	73	37	60	3700
D-339	A	S-P	4	4	5¾ x 8	100	1200	O	....	A-E-G	....	....	74	39	66	3800
D-342	A	M-S-P	4	6	5¾ x 8	152	1200	O	....	A-E-G	T	T	81	43	62	5140
D-353C	A	M-S-P	4	6	6¼ x 8	290	1200	O	....	A-E-G	T	T	76	48	69	6230
D-375D	A	M-S-P	4	V-8	5¾ x 8	238	1200	O	....	A-E-G	....	S-T	84	55	79	8150
D-375D	A	M-S-P	4	V-8	5¾ x 8	302	1200	O	....	A-E-G	M	S	83	55	79	8600
D-375D	A	M-S-P	4	V-8	5¾ x 8	325	1200	O	....	A-E-G	T	S	84	55	79	8650
D-375D	B	S	4	V-8	5¾ x 8	267	1200	O	LM	A-E-G	....	....	84	55	77	8150
D-397D	A	M-S-P	4	V-12	5¾ x 8	360	1200	O	....	A-E-G	....	S	104	58	79	10700
D-397D	A	M-S-P	4	V-12	5¾ x 8	450	1200	O	....	A-E-G	M	S	108	58	79	11200
D-397D	A	M-S-P	4	V-12	5¾ x 8	500	1200	O	....	A-E-G	T	S	107	58	79	11950
D-397D	B	S	4	V-12	5¼ x 8	400	1200	O	LM	A-E-G	....	....	101	58	79	10700

Chicago Pneumatic Tool Company
6 East 44th Street, New York 17, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight
39-CP	D	S-P	4	3	9 x 10½	145	720	S	LM	A	....	....	68	44	67	8900
49-CP	D	S-P	4	4	9 x 10½	195	720	S	LM	A	....	....	84	44	67	10690
69-CP	D	S-P	4	6	9 x 10½	290	720	S	LM	A	....	....	112	44	67	14210
89-CP	D	S-P	4	8	9 x 10½	395	720	S	LM	A	....	....	140	44	67	16750
412-CP	D	S	4	4	11 x 12	330	720	S	LM	A	....	....	106	47	95	21200
512-CP	D	S	4	5	11 x 12	415	720	S	LM	A	....	....	121	55	95	25300
612-CP	D	S-P	4	6	11 x 12	500	720	S	LM	A	....	....	143	55	95	28400
812-CP	D	S-P	4	8	11 x 12	670	720	S	LM	A	....	....	178	68	95	32800
614-CP	D	S-P	4	6	11 x 14¼	500	600	S	LM	A	....	....	143	55	95	29800
814-CP	D	S-P	4	8	11 x 14¼	660	600	S	LM	A	....	....	178	68	95	34500
460-CP	D	S	4	4	16 x 20	600	360	S	LM	A	....	....	171	85	125	64700
462-CP	D	S	4	4	16 x 22	600	327	S	LM	A	....	....	171	85	125	64700
560-CP	D	S	4	5	16 x 20	750	360	S	LM	A	....	....	197	85	125	72800
562-CP	D	S	4	5	16 x 22	750	327	S	LM	A	....	....	197	85	125	72800
660-CP	D	S	4	6	16 x 20	900	360	S	LM	A	....	....	223	85	125	80900
662-CP	D	S	4	6	16 x 22	900	327	S	LM	A	....	....	223	85	125	80900
860-CP	D	S	4	8	16 x 20	1200	360	S	LM	A	....	....	275	106	125	101440
862-CP	D	S	4	8	16 x 22	1200	327	S	LM	A	....	....	275	106	125	101440
69-CPS	D	S-P	4	6	9 x 10½	450	720	S	LM	A	T	....	1 6	58	84	15710
89-CPS	D	S-P	4	8	9 x 10½	600	720	S	LM	A	T	....	19	58	84	18250
412-CPS	D	S	4	4	11 x 12	500	720	S	LM	A	T	....	128	47	113	23100
512-CPS	D	S	4	5	11 x 12	620	720	S	LM	A	T	....	146	55	113	27500
612-CPS	D	S-P	4	6	11 x 12	750	720	S	LM	A	T	....	164	55	113	31600
812-CPS	D	S-P	4	8	11 x 12	1000	720	S	LM	A	T	....	216	68	113	35700
614-CPS	D	S-P	4	6	11 x 14¼	825	600	S	LM	A	T	....	164	55	113	32000
814-CPS	D	S-P	4	8	11 x 14¼	1100	600	S	LM	A	T	....	215	68	113	36000
623-CPS	D	S	4	6	12 x 13	1365	720	S	LM	A	T	....	196	86	135	39000
625-CPS	D	S	4	6	12 x 15	1125	514	S	LM	A	T	....	196	86	135	39000
823-CPS	D	S	4	8	12 x 13	1820	720	S	LM	A	T	....	225	86	135	47000
825-CPS	D	S	4	8	12 x 15	1500	514	S	LM	A	T	....	225	86	135	47000
1023-CPS	D	S	4	10	12 x 13	2280	720	S	LM	A	T	....	266	86	135	55000
1025-CPS	D	S	4	10	12 x 15	1875	514	S	LM	A	T	....	266	86	135	55000
460-CPS	D	S	4	4	16 x 20	875	360	S	LM	A	T	....	210	85	125	68130
462-CPS	D	S	4	4	16 x 22	875	327	S	LM	A	T	....	210	85	125	68130
560-CPS	D	S	4	5	16 x 20	1100	360	S	LM	A	T	....	236	106	125	76540
562-CPS	D	S	4	5	16 x 22	1100	327	S	LM	A	T	....	236	106	125	76540
660-CPS	D	S	4	6	16 x 20	1350	360	S	LM	A	T	....	262	106	125	84950
662-CPS	D	S	4	6	16 x 22	1350	327	S	LM	A	T	....	262	106	125	84950
860-CPS	D	S	4	8	16 x 20	1800	360	S	LM	A	T	....	320	116	125	106800
862-CPS	D	S	4	8	16 x 22	1800	327	S	LM	A	T	....	320	116	125	106800

Clark Bros. Co.
Olean, New York

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
RAD2	A	S	2	2	14 x 14	200	330	B-S	....	A	....	....	....	....	....	28700
RAD32	A	S	2	3	14 x 14	300	330	B-S	....	A	....	....	....	....	....	33850
RAD4	A	S	2	4	14 x 14	400	330	B-S	....	A	....	....	....	....	....	42700
RAD5	A	S	2	5	14 x 14	500	330	B-S	....	A	....	....	....	....	....	52700
RAD6	A	S	2	6	14 x 14	600	330	B-S	....	A	....	....	....	....	....	65550
RAD8	A	S	2	8	14 x 14	800	330	B-S	....	A	....	....	....	....	....	70400
DG4	A	M-S	2	4	12½ x 16	380-500	300-400	B-S	....	A	....	....	....	....	....	42000*
DG5	A	S	2	5	12½ x 16	475-675	300-400	B-S	....	A	....	....	....	....	....	....
DG6	A	M-S	2	6	12½ x 16	570-750	300-400	B-S	....	A	....	....	....	....	....	56000*
DG8	A	S	2	8	12½ x 16	760-1000	300-400	B-S	....	A	....	....	....	....	....	....
HMA-4	B	S-P†	2	4	8¼ x 8¼	175	600	..	LM	A	....	....	....	....	....	....
HMA-6	B	S-P†	2	6	8¼ x 8¼	265	600	..	LM	A	....	....	....	....	....	....
HMA-8	B	S-P†	2	8	8¼ x 8¼	350	600	..	LM	A	....	....	....	....	....	....
HMA-10	B	S-P†	2	10	8¼ x 8¼	440	600	..	LM	A	....	....	....	....	....	....
HMAB-6	B	S	2	6	8⅝ x 8⅞	330	600	..	LM	A	....	....	....	....	....	....
HMAB-8	B	S	2	8	8⅝ x 8⅞	440	600	..	LM	A	....	....	....	....	....	....
HMAB-10	B	S	2	10	8⅝ x 8⅞	550	600	..	LM	A	....	....	....	....	....	....
HSRA-3	B	S	2	3	14 x 14	440	330	..	LM	A	M	....	....	....	....	....
HSRA-4	B	S	2	4	14 x 14	600	330	..	LM	A	M	....	....	....	....	....
HSRA-5	B	S	2	5	14 x 14	725	330	..	LM	A	M	....	....	....	....	....
HSRA-6	B	S	2	6	14 x 14	880	330	..	LM	A	M	....	....	....	....	....
HSRA-8	B	S	2	8	14 x 14	1200	330	..	LM	A	M	....	....	....	....	....
HRA-8	B	S	2	8	14 x 14	1055	330	..	LM	A	....	....	....	....	....	....
TRA-6	B	S	2	6	14 x 14	1200	360	..	LM	A	T	....	....	....	....	....
TRA-7	B	S	2	7	14 x 14	1450	360	..	LM	A	T	....	....	....	....	....
TRA-8	B	S	2	8	14 x 14	1650	360	..	LM	A	T	....	....	....	....	....
TRA-10	B	S	2	10	14 x 14	1950	360	..	LM	A	T	....	....	....	....	....
HBA-5	B	S	2	5	17 x 17	1200	330	..	LM	A	....	....	....	....	....	....
HBA-6	B	S	2	6	17 x 17	1440	330	..	LM	A	....	....	....	....	....	....
HBA-8	B	S	2	8	17 x 17	1920	330	..	LM	A	....	....	....	....	....	....
HBA-10	B	S	2	10	17 x 17	2400	330	..	LM	A	....	....	....	....	....	....
TLA-5	B	S	2	5	17 x 19	1850	330	..	LM	A	T	....	....	....	....	....
TLA-6	B	S	2	6	17 x 19	2200	330	..	LM	A	T	....	....	....	....	....
TLA-8	B	S	2	8	17 x 19	2950	330	..	LM	A	T	....	....	....	....	....
TLA-10	B	S	2	10	17 x 19	3700	330	..	LM	A	T	....	....	....	....	....

** Marine weight.* *† Semi portable.* *All engines have open type combustion chambers*

Climax Engine & Pump Mfg. Co.
Clinton, Iowa

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
R110	B	S-P	4	4	6¼ x 7	95	1050		B-HM	A-E-G	....	....	58	31	49	2450
R165	B	S-P	4	6	6¼ x 7	140	1050	..	B-HM	A-E-G	....	....	74	30	51	3250
K67	B	S-P	4	6	7 x 7	194	1050	..	B-HM	A-E-G	....	....	71	30	58	5400
K75	B	S-P	4	6	7¼ x 7	216	1050	..	B-HM	A-E-G	....	....	71	30	58	5400
V80	B	S	4	8	7 x 7	250	1050	..	B-HM	A-E-G	....	....	79	51	59	8400
V85	B	S	4	8	7¼ x 7	285	1050	..	B-HM	A-E-G	....	....	79	51	59	8600
V122	B	S	4	12	7 x 7	380	1050	..	B-HM	A-E-G	....	....	103	51	59	11000
V125	B	S	4	12	7¼ x 7	444	1050	..	B-HM	A-E-G	....	....	103	51	59	11600
C46	B	S	4	1	5 x 6¼	7.5	600	..	HM	H-E-G	....	....	47	38	39	1360
C66	B	S	4	1	5¾ x 7⅛	11	550	..	HM	H-E-G	....	....	53	40	44	1575
C96	B	S	4	1	7 x 8½	16.6	500	..	HM	H-E-G	....	....	63	47	49	2580

Continental Motors Corporation
Muskegon, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
ZD129	A	S**	4	4	3½ x 3⅞	34*	2000	R	....	E	....	....	....	....	....	485
GD157	A	M-S-P	4	4	3⅝ x 4⅜	39*	2000	R-B	....	E	....	....	32	16	31	605
ED201**	A	S**	4	4	3⅝ x 4⅞	45.8*	2000	R-B	....	E	....	....	....	....	....	655
HD243	A	S-P	4	4	3¾ x 5½	54.7*	2000	R-B	....	E	....	....	34	22	35	840
HD260**	A	S**	4	4	3⅞ x 5½	59.3*	2000	R-B	....	E	....	....	34	22	35	840
HD277**	A	S**	4	4	4 x 5½	63.2*	2200	R-B	....	E	....	....	34	22	35	850
JD382 **	A	S**	4	4	4½ x 6	72.5*	1600	B	....	E	....	....	....	....	....	925
TD427	A	S	4	6	4⅝ x 4⅞	106.5*	2000	B	....	E	....	....	47	25	36	1300
RD572	A	S	4	6	4⅜ x 5⅜	154*	2000	B	....	E	....	....	52	30	43	1845
VD603	A	S	4	8	4⅜ x 4¼	175*	2600	R	....	E	....	....	44	34	47	1696
SD802	A	S	4	6	5⅜ x 5½	202*	1800	B	....	E	....	....	....	....	....	2160
TD6427	A	M-P	4	6	4⅝ x 4⅞	116*	2400	B	....	E	....	....	47	25	36	1270
RD6572	A	M-P	4	6	4⅜ x 5⅜	172*	2400	B	....	E	....	....	52	30	46	1785
VD8603	A	P	4	8	4⅜ x 4¼	182*	2800	R	....	E	....	....	44	34	47	1680
SD6802	A	M-P	4	6	5⅜ x 5½	225*	2200	B	....	E	....	....	....	....	....	2140
Y-69	B	S-P	4	4	2½ x 3½	21.4*	2400	..	B-LM-HM	E	....	....	26	15	26	265
Y-112	B	S-P	4	4	3⅛ x 3½	32*	2400	..	B-LM-HM	E	....	....	26	15	26	265
F-162	B	S-P	4	4	3⅞ x 4⅜	49*	2400	..	B-LM-HM	E	....	....	29	16	29	370
F-226	B	S-P	4	6	3⅛ x 4⅜	73*	2400	..	B-LM-HM	E	....	....	36	16	29	510
M-330	B	S-P	4	6	4 x 4¾	104*	2400	..	B-LM-HM	E	....	....	43	22	34	725
B-427	B	S-P	4	6	4⅛ x 4⅞	127*	2400	..	B-LM-HM	E	....	....	46	22	34	870
U-501	B	S-P	4	6	4½ x 5¼	160*	2400	..	B-LM-HM	E	....	....	52	28	45	1670
R-602	B	S-P	4	6	4⅞ x 5⅛	191.7*	2400	..	B-LM-HM	E	....	....	52	28	45	1670
S-749	B	S-P	4	6	5⅛ x 5½	217*	2200	..	B-LM-HM	E	....	....	58	28	48	1910

*Horsepower Given is Bare Engine Rating **Available for Industrial Applications only. H.P. is Bare Engine. R.P.M. is Governed Speed.

The Cooper-Bessemer Corporation
Mt. Vernon, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
FW6	A	M-S-P	4	6	9 x 10½	430	1000	S	....	A	....	O	130	35	80	17800
FW6T	A	M-S-P	4	6	9 x 10½	900	1000	S	....	A	T	O	176	35	80	18300
FVA8	A	M-S-P	4	8	9 x 10½	575	1000	S	....	A	....	O	102	44	58	22000

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
FVA8T	A	M-S-P	4	8	9 x 10½	1200	1000	S	.....	A	T	O	124	44	58	27240
FVA12	A	M-S-P	4	12	9 x 10½	860	1000	S	.....	A	.....	O	140	44	58	26000
FVA12T	A	M-S-P	4	12	9 x 10½	1800	1000	S	.....	A	T	O	140	44	58	37800
FVA16	A	M-S-P	4	16	9 x 10½	1150	1000	S	.....	A	.....	O	165	44	58	32000
FVA16T	A	M-S P	4	16	9 x 10½	2400	1000	S	.....	A	T	O	165	44	58	46430
GS6	D	M-S	4	6	10½ x 13½	565	750	O	B	A	.....	D	142	38	68	21500
GS6T	D	M-S	4	6	10½ x 13½	1200	750	O	B	A	T	D	174	38	68	22250
GS8	D	M-S	4	8	10½ x 13½	775	750	O	B	A	.....	D	175	38	68	29500
GS8T	D	M-S	4	8	10½ x 13½	1600	750	O	B	A	T	D	206	38	68	30250
JS5	D	S	4	5	13 x 16	515	450	O	B	A	.....	.....	149	45	80	41000
JS6	D	M-S	4	6	13 x 16	705	514	O	B	A	.....	D	171	45	80	44000
JS6T	D	M-S	4	6	13 x 16	1485	514	O	B	A	T	D	200	45	80	45000
JS7	D	S	4	7	13 x 16	820	514	O	B	A	.....	.....	193	45	80	48000
JS7T	D	S	4	7	13 x 16	1735	514	O	B	A	T	.....	221	45	80	49000
JS8	D	M-S	4	8	13 x 16	935	514	O	B	A	.....	D	210	45	80	51000
JS8T	D	M-S	4	8	13 x 16	1980	514	O	B	A	T	D	239	45	80	52000
LS6	D	M-S	4	6	15½ x 22	965	360	O	B	A	.....	D	224	56	120	76000
LS6T	D	M-S	4	6	15½ x 22	2040	360	O	B	A	T	D	251	56	120	77000
LS7	D	S	4	7	15½ x 22	1125	360	O	B	A	.....	.....	248	56	120	91000
LS7T	D	S	4	7	15½ x 22	2380	360	O	B	A	T	.....	270	56	120	92000
LS8	D	M-S	4	8	15½ x 22	1285	360	O	B	A	.....	D	276	56	120	106000
LS8T	D	M-S	4	8	15½ x 22	2720	360	O	B	A	T	D	299	56	120	107000
LSV12	D	M-S	4	12	15½ x 22	1925	360	O	B	A	.....	D	252	68	117	194500
LSV12T	D	M-S	4	12	15½ x 22	4100	360	O	B	A	T	D	300	68	117	197500
LSV16	D	M-S	4	16	15½ x 22	2565	360	O	B	A	.....	D	307	68	117	232500
LSV16T	D	M-S	4	16	15½ x 22	5450	360	O	B	A	T	D	355	68	117	237500

Engines have open combustion chamber. Height is given above shaft. Width is between bolt centers. All weights and dimensions for stationary units.

Cummins Engine Company, Inc.
Columbus, Indiana

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
J-6	A	M-S-P	4	6	4½ x 5	95	1800	O	.....	E	.....	T	47	26	42	1505†
JF-6	A	M-S-P	4	6	4½ x 5	110	2200	O	.....	E	.....	T	47	26	42	1545†
JN-6	A	M-S-P	4	6	4½ x 5	125	2500	O	.....	E	.....	T	47	27	42	1555†
NHC-4	A	M-S-P	4	4	5½ x 6	125	2000	O	.....	E	.....	T	44	27	48	1815†
JT-6	A	M-S-P	4	6	4½ x 5	175	2500	O	.....	E	T	S	47	28	44	1615†
JNS-6	A	M-S-P	4	6	4½ x 5	165	2500	O	.....	E	M	S	47	26	42	1600†
NT-6	A	M-S-P	4	6	5½ x 6	250	2100	O	.....	E	T	C	61	38	49	2515†
NTO-6	A	P-S-M	4	6	5½ x 6	262	2100	O	.....	E	T	.....	61	38	49	2515†
NRT-6	A	M-S-P	4	6	5½ x 6	300	2100	O	.....	E	T	C	61	38	49	2525†
HRC-400	A	M-S-P	4	4	5½ x 6	110	1800	O	.....	E	.....	T	44	32	48	1755†
JS-600	A	M-P	4	6	4½ x 5	150	2500	O	.....	E	M	.....	47	25	40	1600†
H-600	A	M-S-P	4	6	4¾ x 6	150	1800	O	.....	E	.....	T	59	30	49	2330†
HR-600	A	M-S-P	4	6	5½ x 6	165	1800	O	.....	E	.....	T	59	30	49	2330†
HRF-600	A	P	4	6	5½ x 6	180	2000	O	.....	E	.....	.....	61	30	49	2380†
HS-600	A	S-P	4	6	4¾ x 6	200	1800	O	.....	E	M	T	58	32	49	2540†
NH-600	A	M-S-P	4	6	5¼ x 6	210	2100	O	.....	E	.....	T	61	31	49	3420†
NHH-600	A	P	4	6	5¼ x 6	200	2100	O	.....	E	.....	.....	66	61	23	2500†
HRS-600	A	M-S-P	4	6	5½ x 6	225	1800	O	.....	E	M	T	58	32	49	2540†
NHS-600	A	M-S-P	4	6	5¼ x 6	275	2100	O	.....	E	M	C	60	34	49	2720†
NHRS-600	A	M-S-P	4	6	5¼ x 6	300	2100	O	.....	E	M	C	60	34	49	2725†
NHHRS-600	A	P	4	6	5¼ x 6	300	2100	O	.....	E	M	.....	66	61	23	2805†
NVH-1200	A	M-S-P	4	12	5¼ x 6	400	2100	O	.....	E	.....	S	73	49	55	5150†
VT-12	A	M-S-P	4	12	5¼ x 6	600	2100	O	.....	E	T	C	73	40	60	5610†
L-600	A	M-S	4	6	7 x 10	250	1000	O	.....	A-E	.....	C	98	39	58	7590*
LR-600	A	M-S	4	6	7¼ x 10	300	1100	O	.....	A-E	.....	C	98	39	58	7590*
LR-600GAS	B	S	4	6	7¼ x 10	315	1100	.....	HM	A-E	.....	.....	98	39	58	7590*
NRTO-6	A	M-S-P	4	6	5½ x 6	335	2100	O	.....	E	T	C	61	38	49	2525†
HHR-600	A	P	4	6	5½ x 6	165	1800	O	.....	E	.....	.....	66	60	24	2420†
HHRF-600	A	P	4	6	5½ x 6	180	2000	O	.....	E	.....	.....	66	60	24	2465†
NHHT-6	A	P	4	6	5½ x 6	250	2100	O	.....	E	T	.....	66	67	23	2590†
NHHRT-6	A	P	4	6	5½ x 6	300	2100	O	.....	E	T	.....	66	67	23	2605†
NT-4	A	P	4	4	5½ x 6	165	2000	O	.....	E	T	.....	44	29	53	1875†
LRT-6	A	S	4	6	7¼ x 10	450	1100	O	.....	E	T	.....	110	39	59	7690†
J-4	A	P	4	4	4½ x 5	60	1800	O	.....	E	.....	.....	35	25	44	990†

All except "L" models suitable for automotive and other portable applications.
*† Automotive weight with all accessory equipment; also approx. weight of stationary engine w/o radiator or clutch and approx. weight of marine engine w/o reverse gear. * Stationary engine and approx. marine weight w/o reverse gear. Hp. and RPM are maximum ratings.*

Enterprise Engine & Machinery Co.
Subsidiary of General Metals Corp.
18th & Florida Streets, San. Francisco, Calif.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
DM3	D*	M-S-P	4	3	8 x 10	73-162	450-1000	S	ML-P	A-E	.....	**	60	41	64	8000
DM33	D	M-S-P	4	3	8 x 10	116-381	450-1000	S	LM-P	A-E	T	**	60	41	64	8700
DM4	D	M-S-P	4	4	8 x 10	97-216	450-1000	S	LM-P	A-E	.....	**	68	41	67	10300
DM34	D	M-S-P	4	4	8 x 10	154-508	450-1000	S	LM-P	A-E	T	**	68	41	67	11100
DM6	D	M-S-P	4	6	8 x 10	146-324	450-1000	S	LM-P	A-E	.....	**	92	41	64	13200
DM36	D	M-S-P	4	6	8 x 10	231-762	450-1000	S	LM-P	A-E	T	**	92	41	64	13800
DM8	D	M-S-P	4	8	8 x 10	194-432	450-1000	S	LM-P	A-E	.....	**	116	41	64	16100
DM38	D	M-S-P	4	8	8 x 10	308-1015	450-1000	S	LM-P	A-E	T	**	116	41	64	18000
DG-6	D	M-S-P	4	6	12 x 15	273-819	250-750	S	LM-P	A	.....	D	147	58	99	38800
DG-36	D	M-S-P	4	6	12 x 15	484-1928	250-750	S	LM-P	A	T	D	147	58	99	39900
DG-8	D	M-S-P	4	8	12 x 15	364-1092	250-750	S	LM-P	A	.....	D	181	58	99	48000
DG-38	D	M-S-P	4	8	12 x 15	578-2570	250-750	S	LM-P	A	T	D	181	58	99	49962
DQ-6	D	M-S-P	4	6	16 x 20	647-1036	250-400	S	LM-P	A	.....	D	197	74	126	87400
DQ-36	D	M-S-P	4	6	16 x 20	1028-2437	250-400	S	LM-P	A	T	D	197	74	126	89600
DQ-8	D	M-S-P	4	8	16 x 20	863-1381	250-400	S	LM-P	A	.....	D	245	74	126	105513
DQ-38	D	M-S-P	4	8	16 x 20	1371-3249	250-400	S	LM-P	A	T	D	245	74	126	107913
DR-6	D	M-S-P	4	6	17 x 21	767 1228	250-400	S	LM-P	A	.....	D	197	74	126	89900
DR-36	D	M-S-P	4	6	17 x 21	1219-2889	250-400	S	LM-P	A	T	D	197	74	126	92500
DR-8	D	M-S-P	4	8	17 x 21	945-1637	250-400	S	LM-P	A	.....	D	245	74	126	107300
DR-38	D	M-S-P	4	8	17 x 21	1625-3852	250-400	S	LM-P	A	T	D	245	74	126	109900
DRV-12	D	M-S-P	4	12	17 x 21	1228-2455	200-400	S	LM-P	A	.....	D	197	96	145	142600
DRV-12-3	D	M-S-P	4	12	17 x 21	2891-5782	200-400	S	LM-P	A	T	D	197	96	145	147900
DRV-16	D	M-S-P	4	16	17 x 21	1637-3274	200-400	S	LM-P	A	.....	D	245	96	145	181800
DRV-16-3	D	M-S-P	4	16	17 x 21	3852-7703	200-400	S	LM-P	A	T	D	245	96	145	189100

**All models available with trifuel equipment **Reverse and reduction gear used—make varies.*

Fairbanks, Morse & Company
600 S. Michigan Avenue, Chicago, Ill.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
31A6¼	A	M-S-P	2	5	6¼ x 9	175	720	O	....	A	....	D	....	....	....	.....
31A6¼	A	M-S-P	2	6	6¼ x 9	210	720	O	....	A	....	D	....	....	....	.....
31A6¼	A	M-S-P	2	7	6¼ x 9	245	720	O	....	A	....	D	....	....	....	.....
31A6¼	A	M-S-P	2	8	6¼ x 9	280	720	O	....	A	....	D	....	....	....	.....
31A8½	C	M-S-P	2	5	8½ x 11	300-325	514-525	O	....	A	....	D	....	....	....	.....
31A8½	C	M-S-P	2	6	8½ x 11	360-390	514-525	O	....	A	....	D	....	....	....	.....
31A8½	C	M-S-P	2	7	8½ x 11	420-455	514-525	O	....	A	....	D	....	....	....	.....
31A8½	C	M-S-P	2	8	8½ x 11	480-520	514-525	O	....	A	....	D	....	....	....	.....
31A18	C	S	2	6	18 x 27	2100	277	O	....	A	....	....	....	....	....	.....
31A18	C	S	2	8	18 x 27	2800	277	O	....	A	....	....	....	....	....	.....
31A18	C	S	2	10	18 x 27	3500	277	O	....	A	....	....	....	....	....	.....
32E12	A	S	2	2	12 x 15	120	360	O	....	A	....	....	....	....	....	.....
32E12	A	S	2	3	12 x 15	180	360	O	....	A	....	....	....	....	....	.....
32E14	A	S	2	2	14 x 17	150	300	O	....	A	....	....	....	....	....	.....
32E14	A	S	2	3	14 x 17	225	300	O	....	A	....	....	....	....	....	.....
32E14	A	S	2	4	14 x 17	300	300	O	....	A	....	....	....	....	....	.....
32E14	A	S	2	5	14 x 17	375	300	O	....	A	....	....	....	....	....	.....
32E14	A	S	2	6	14 x 17	450	300	O	....	A	....	....	....	....	....	.....
33F12	A	S	2	5	12 x 15	500	400	O	....	A	....	....	....	....	....	.....
33F12	A	S	2	6	12 x 15	600	400	O	....	A	....	....	....	....	....	.....
33F14	A	S	2	5	14 x 17	575	300	O	....	A	....	....	....	....	....	.....
33F14	A	S	2	6	14 x 17	690	300	O	....	A	....	....	....	....	....	.....
33F14	A	S	2	7	14 x 17	805	300	O	....	A	....	....	....	....	....	.....
33F16	C	S	2	4	16 x 20	800	300	O	....	A	....	....	....	....	....	.....
33F16	C	S	2	5	16 x 20	1000	300	O	....	A	....	....	....	....	....	.....
33F16	C	S	2	6	16 x 20	1200	300	O	....	A	....	....	....	....	....	.....
33F16	C	S	2	7	16 x 20	1400	300	O	....	A	....	....	....	....	....	.....
33F16	C	S	2	8	16 x 20	1600	300	O	....	A	....	....	....	....	....	.....
33F16	C	S	2	10	16 x 20	2000	300	O	....	A	....	....	....	....	....	.....
37F12	A	M	2	5	12 x 15	500	400	O	....	A	....	D	....	....	....	.....
37F12	A	M	2	6	12 x 15	600	400	O	....	A	....	D	....	....	....	.....
37E14	A	M	2	5	14 x 17	575	300	O	....	A	....	D	....	....	....	.....
37E14	A	M	2	6	14 x 17	690	300	O	....	A	....	D	....	....	....	.....
37E14	A	M	2	7	14 x 17	805	300	O	....	A	....	D	....	....	....	.....
37F16	A	M	2	5	16 x 20	1000	300	O	....	A	....	D	....	....	....	.....
37F16	A	M	2	6	16 x 20	1200	300	O	....	A	....	D	....	....	....	.....
37F16	A	M	2	7	16 x 20	1400	300	O	....	A	....	D	....	....	....	.....
37F16	A	M	2	8	16 x 20	1600	300	O	....	A	....	D	....	....	....	.....
37F16	A	M	2	10	16 x 20	2125	300	O	....	A	....	D	....	....	....	.....
38F5¼	D	M-S-P	2	4	5¼ x 7¼	150-330	600-1200	O	....	A-E	....	S	....	....	....	.....
38F5¼	D	M-S-P	2	5	5¼ x 7¼	188-413	600-1200	O	....	A-E	....	S	....	....	....	.....
38F5¼	D	M-S-P	2	6	5¼ x 7¼	225-495	600-1200	O	....	A-E	....	S	....	....	....	.....
38F5¼	D	M-S-P	2	7	5¼ x 7¼	263-578	600-1200	O	....	A-E	....	S	....	....	....	.....
38F5¼	D	M-S-P	2	8	5¼ x 7¼	300-660	600-1200	O	....	A-E	....	S	....	....	....	.....
38F5¼	D	M-S-P	2	10	5¼ x 7¼	375-825	600-1200	O	....	A-E	....	F	....	....	....	.....
38D8½	D	M-S-P	2	4	8½ x 10	400-800	450-900	O	....	A	....	D	....	....	....	.....
38D8½	D	M-S-P	2	5	8½ x 10	500-1000	450-900	O	....	A	....	D	....	....	....	.....
38D8½	D	M-S-P	2	6	8½ x 10	600-1200	450-900	O	....	A	....	D	....	....	....	.....
39D8½	D	M-S-P	2	8	8½ x 10	800-1600	450-900	O	....	A	....	D	....	....	....	.....
38D8½	D	M-S-P	2	10	8½ x 10	1000-2000	450-900	O	....	A	....	D	....	....	....	.....
38D8½	D	M-S-P	2	12	8½ x 10	1200-2400	450-900	O	....	A	....	D	....	....	....	.....
45C3½	A	S	4	1	3½ x 4	5½	1800	D	....	H-E	....	....	....	....	....	.....
45C4½	A	S	4	1	4½ x 4½	10½	1800	D	....	H-E	....	....	....	....	....	.....
45C4½-2	A	M-S	4	2	4½ x 5¼	32	1800	D	....	H-E	....	C-P	....	....	....	.....
48A3½	A	M-S	4	2	3½ x 4	13½	1500	O	....	E	....	S-T	....	....	....	.....
48A3½	A	M-S-P	4	4	3½ x 4	28	1800	O	....	E	....	C-P	....	....	....	.....
48A4½	A	M-S-P	4	4	4½ x 5	43-78	1200-2000	O	....	E	....	....	....	....	....	.....
49B4½	A	M-S-P	2	2	4½ x 5½	58	1800	....	....	A-E	....	....	....	....	....	.....
49B4½	A	M-S-P	2	3	4½ x 5½	90	1800	....	....	A-E	....	....	....	....	....	.....
49B4½	A	M-S-P	2	4	4½ x 5½	127	1800	....	....	A-E	....	....	....	....	....	.....
49B4½	A	M-S-P	2	6	4½ x 5½	180	1800	....	....	A-E	....	....	....	....	....	.....

Ford Motor Company
Ford Division
Plymouth & Middlebelt Roads, Detroit, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
X	A	M-S-P	4	4	3.94 x 4.52	48	2250	*	....	E	....	....	31	28	35	690

* *Simm's*

General Motors Corporation
Cleveland Diesel Engine Division
2160 W. 106 St., Cleveland, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-268A	D	M-S	2	6	6½ x 7	340	1200	GM	....	A-E	....	F	97	41	67*	7000
8-268A	D	M-S	2	8	6½ x 7	450	1200	GM	....	A-E	....	F	117	41	67*	8600
8-498	D	M-S	2	8	8¼ x 10½	1400	850	GM	....	A-E	T	F	159	64	112*	30600
12-498	D	M-S	2	12	8¼ x 10½	2100	850	GM	....	A-E	T	F	193	64	112*	40500
16-498	D	M-S	2	16	8¼ x 10½	2800	850	GM	....	A-E	T	F	234	66	121*	50500
8-567C	D	M-S	2	8	8½ x 10	800	800	GM	....	A-E	....	F	140	63	112*	16600
12-567C	D	M-S	2	12	8½ x 10	1200	800	GM	....	A-E	....	F	175	65	112*	27800
16-567C	D	M-S	2	16	8½ x 10	1600	800	GM	....	A-E	....	F	214	62	112*	33900
16-358	B	M-S	2	16	12½ x 14½	3500	600	....	B	E	....	F	197	126	113*	86500

Dimensions and weights are for basic engines. F *Falk reverse-reduction gear.* * *Height is over-all engine height.*

General Motors Corporation
Detroit Diesel Engine Division
13400 W. Outer Drive, Detroit, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
2-71	A	S-P	2	2	4.25 x 5	48	1800	O	....	E-HY	M**	....	31	28	40	960
4-51	A	M-S-P	2	4	4.1 x 4.1	54-87	2200-3000	O	....	E	M**	P	39	28	34	1300
3-71	A	M-S-P	2	3	4.25 x 5	75-110	1800-2300	O	....	E-HY	M**	O	37	29	41	1525
4-71	A	M-S-P	2	4	4.25 x 5	101-151	1800-2300	O	....	E-HY	M**	O	43	29	42	1780
4-71†	A	M	2	4	4.25 x 5	151††	2300	O	....	E	M**	O	59	38	33	1920
4-71T	A	M-S-P	2	4	4.25 x 5	114-197	1800-2300	O	....	E	T	O	44	46	41	1760
4-71T	A	M	2	4	4.25 x 5	197††	2300	O	....	E	T	O	63	89	35	1888
6-71	A	M-S-P	2	6	4.25 x 5	154-235	1800-2300	O	....	E-HY	M**	O	54	29	43	2190
6-71†	A	M	2	6	4.25 x 5	235††	2300	O	....	E	M**	O	71	38	34	2270
6-71T	A	M-S-P	2	6	4.25 x 5	172-300	1800-2300	O	....	E	T	O	56	34	48	2250
Twin 4-71	A	S-P	2	8	4.25 x 5	197	1800	O	....	E-HY	M**		83	56	58	4820
Twin 6-71	A	M-S-P	2	12	4.25 x 5	301-470	1800-2300	O	....	E-HY	M**	O	95	56	58	5620
Twin 6-71*	A	M	2	12	4.25 x 5	295-470	1800-2300	O	....	E	M**	O	129	38	56	7550
Quad 6-71	A	M-S-P	2	24	4.25 x 5	590-893	1800-2100	O	....	E-HY	M**	O	128	57	58	12850
6-110	A	M-S-P	2	6	5 x 5.6	230-289	1800-2000	O	....	E-HY	M**	O	69	32	49	2960
Twin 6-110	A	S-P	2	12	5 x 5.6	416	1800	O	....	E-HY	M**		123	66	87	11440
Twin 6-110*	A	M	2	12	5 x 5.6	440-578	1800-2000	O	....	E	M**	O	146	62	69	11000

** Tandem arrangement. ** Pressure Scavenging. † Inclined engine. Weights and dimensions are given for industrial ("S" & "P") units except on engines indicated as solely for marine application. Where a horsepower range is shown, high end is "Rated" (not continuous) brake horsepower for applications such as pleasure craft, fire boats and other intermittent operation. Weights and dimensions for marine engines vary with gear selected and on "Twins" and "Quads", radiators and power take-offs are included. Torque converters are available with industrial models. ††Rated shaft horsepower.*

General Motors Corporation
Electro-Motive Division
LaGrange, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-567C	C	S-P	2	6	8¼ x 10	540-600	720-800	O	....	E	....	....	126	65	89	15000
8-567C	C	S-P	2	8	8¼ x 10	720-875	720-835	O	....	E	....	....	142	63	89	18000
12-567C	C	S-P	2	12	8¼ x 10	1080-1310	720-835	O	....	E	....	....	156	65	89	25000
16-567C	C	S-P	2	16	8¼ x 10	1440-1750	720-835	O	....	E	....	....	215	63	89	31500

Engines are available for Marine use through Cleveland Diesel Engine Division, General Motors Corporation.

Gray Marine Motor Company
710 Canton Avenue, Detroit 7, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
4-D129	A	M	4	4	3¼ x 3½	25	2000	R	....	E	....	S-P	45	24	28	656
4-D157	A	M	4	4	3⅝ x 4⅜	30	1800	R	....	E	....	SC	50	26	27	1100
4-D277	A	M	4	4	4 x 5½	65	2000	R	....	E	....	SC	56	26	39	1440
6-D427	A	M	4	6	4⅛ x 4⅞	100	2200	R	....	E	....	PSC	63	28	33	1475
6-D572	A	M	4	6	4¾ x 5⅝	135	2200	B	....	E	....	PSC	69	29	42	2510

All data is for complete marine units.

Hallett, Diesel Engine Division
American M. A. R. C., Inc.
1601 W. Florence Avenue, Inglewood, California

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AC1	A	S	4	1	3½ x 3¼	6.5	1800	B	....	H-E*	....	....	27	15	24	220
AC2	A	S	4	2	3½ x 3¼	14	1800	B	....	H-E*	....	....	34	25	25	350
D1	A	M-S	4	1	3⅞ x 4½	8	1500	B	....	H-E*	....	S	24	20	36	450
D2	A	M-S	4	2	3⅞ x 4½	18	1500	B	....	E	....	S	32	25	32	568
WC1	A	S	4	1	3½ x 3½	7	1800	B	....	H-E*	....	....	27	15	24	250
WC2	A	M-S	4	2	3½ x 3½	12-14	1800	B	....	H-E*	....	S	34	25	25	375
WC4S	A	M-S	4	4	3½ x 3½	28	1800	B	....	E	....	S	32	27	28	535

*Engines have pre-combustion chamber. * Model designation refers to hand starting—"S" is added to indicate electric starting; "M" indicates marine adaption. Dimensions and weights are for basic engine.*

Harnischfeger Corporation, P & H Diesel Engine Division
500 South Main Street, Crystal Lake, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.*	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
387C-18	A	M-P	2	2	4½ x 5½	58	1800	B-D-S	....	E	M	S-T-W	33	29	41	1030
387C-18	A	M-P	2	3	4½ x 5½	90	1800	B-D-S	....	E	M	S-T-W	39	29	41	1350
487C-18	A	M-P	2	4	4½ x 5½	128	1800	B-D-S	....	E	M	S-T-W	46	29	41	1580
687C-18	A	M-P	2	6	4½ x 5½	180	1800	B-D-S	....	E	M	S-T-W	60	29	41	1900

*Weights shown are for "P" units. *Continuous horsepower ratings for 24-hour operation.*

Hercules Motors Corporation
Canton, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D1X42	A	M-S-P	4	1	3⅝ x 4	12	2200	R-B	....	E	....	....	18	21	30	325
D1X83	A	M-S-P	4	2	3⅝ x 4	24¼	2200	R-B	....	E	....	....	22	22	31	400
D1XC	A	M-S-P	4	2	4 x 4½	27 6	1800	B	....	E	....	....	22	20	21	550
D1XD	A	M-S-P	4	2	4¼ x 4½	30	1800	B	....	E	....	....	22	20	21	550
DD-130*	A	M-S-P	4	3	3½ x 4½	33	1800	R-B	....	E	....	....	32	21	32	550
DD-149*	A	M-S-P	4	3	3¾ x 4½	38	1800	R-B	....	E	....	....	32	21	32	550
DD-169*	A	M-S-P	4	3	4 x 4½	43	1800	R-B	....	E	....	....	32	21	32	550
D1X4B	A	M-S-P	4	4	3¼ x 4	38.5	2200	B	....	E	....	....	31	22	19	600
D1X4D	A	M-S-P	4	4	3⅝ x 4	48.5	2200	R-B	....	E	....	....	31	22	19	600
DD173*	A	M-S-P	4	4	3½ x 4½	46.3	1800	R-B	....	E	....	....	31	22	33	600
D1X4E	A	M	4	4	3⅞ x 4	75	3000	..	....	E	....	....	45	28	21	890
D1X4ES	A	M	4	4	3⅞ x 4	95	3000	..	....	E	M	....	45	32	21	990
TCD-188M	A	M	4	4	3⅞ x 4	78	2800	R-B	....	E	T	....	....	....	....	....
D0OB	A	M-S-P	4	4	3⅝ x 4½	48	1800	R-B	....	E-G	....	....	30	23	20	750
DD198*	A	M-S-P	4	4	3⅝ x 4½	53.2	1800	R-B	....	E	....	....	31	22	33	600
D0OC	A	M-S-P	4	4	4 x 4½	55	1800	B	....	E-G	....	....	30	23	20	750
DD226*	A	M-S-P	4	4	4 x 4½	60.5	1800	R-B	....	E	....	....	31	22	33	600
D0OD	A	M-S-P	4	4	4¼ x 4½	61 5	1800	R-B	....	E-G	....	....	30	23	20	750
D1X6D	A	M-S-P	4	6	3⅝ x 4	77.5	2200	R-B	....	E-G	....	....	39	24	19	800
DD260*	A	M-S-P	4	6	3½ x 4½	69.5	1800	R-B	....	E	....	....	40	22	36	750
D1X6-272	A	M-S-P	4	6	3 11/16 x 4¼	85	2200	R-B	....	A-E-G	....	....	39	24	38	800
D1X6-300	A	M-S-P	4	6	3⅞ x 4¼	94	2200	R-B	....	A-E-G	....	....	39	24	38	800
D1X6E	A	M	4	6	3⅞ x 4	115	3000	..	....	E	....	....	54	31	21	1380
D1X6ES	A	M	4	6	3⅞ x 4	150	3000	..	....	E	M	....	54	34	21	1490
TCD-283M	A	M	4	6	3⅞ x 4	120	2800	R-B	....	E	T	....	....	....	....	....
DJXB	A	M-S-P	4	6	3½ x 4½	60	1800	R-B	....	A-E-G	....	....	37	23	21	950
DJXC&H	A	M-S-P	4	6	3⅝ x 4½	69-79	1800	R-B	....	A-E-G	....	....	37	23	21	950
DD298*	A	M-S-P	4	6	3¾ x 4½	79	1800	R-B	....	E	....	....	40	22	36	750
DJXHF	A	M-S-P	4	6	3¾ x 4½	79	1800	R-B	....	A-E-G	....	....	39	34	13 x 11	950
DD339*	A	M-S-P	4	6	4 x 4½	91	1800	R-B	....	E	....	....	40	22	36	750
DWXC	A	M-S-P	4	6	4 x 4⅝	94	1800	R-B	....	A-E-G	....	....	41	27	24	1350
DWXD	A	M-S-P	4	6	4¼ x 4⅝	107	1800	R-B	....	A-E-G	....	....	41	27	24	1350
DWXLD	A	M-S-P	4	6	4¼ x 5	112	1800	R-B	....	A-E-G	....	....	41	27	25	1350
DWXLDF	A	M-S-P	4	6	4¼ x 5	106	1800	R-B	....	A-E-G	....	....	37	37	9 x 9	1325
DWXE	A	M	4	6	4⅜ x 4¾	148	2600	..	....	E	....	....	67	33	24	2200
DWXETS	A	M	4	6	4⅜ x 4¾	198	2600	..	....	E	T	....	67	33	24	2400
DRXB	A	M-S-P	4	6	4⅜ x 5¼	106	1600	R-B	....	A-E-G	....	....	45	26	25	1600
DRX-501	A	M-S-P	4	6	4½ x 5¼	113	1600	R-B	....	A-E-G	....	....	47	26	39	1600
TCD-501	A	M-S-P	4	6	4½ x 5¼	144	1600	R-B	....	A-E-G	T	....	50	28	51	1700
DRXC	A	M-S-P	4	6	4⅝ x 5¼	118	1600	R-B	....	A-E-G	....	....	45	26	25	1600
DFXB	A	M-S-P	4	6	5 x 6	160	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXC	A	M-S-P	4	6	5¼ x 6	176	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXD	A	M-S-P	4	6	5½ x 6	191	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXE	A	M-S-P	4	6	5⅝ x 6	199	1600	R-B	....	A-E-G	....	....	56	30	31	2500
TCD-895	A	M-S-P	4	6	5⅝ x 6	258-318	1600-2000	R-B	....	A-E-G	T	....	75	28	52	2700
DFXH	A	M-S-P	4	6	5⅝ x 6	220-260	1600-2100	R-B	....	A-E-G	....	....	56	30	32	2600
DFXH-TS	A	M-S-P	4	6	5⅝ x 6	267	1600	R-B	....	A-E-G	T	....	73	30	47	2700
DFXHF	A	M-S-P	4	6	5⅝ x 6	220	1600	R-B	....	A-E-G	....	....	51	49	18 x 15	2600
DIXV8-402	A	S-P	4	V-8	4 x 4	127	2200	R	....	A-E	....	....	39	33	20	1050
DNXV8D	A	M-S-P	4	V-8	6¼ x 6	325-388	1600-2000	B	....	A-E-G	....	....	52	42	32	4200
TCD-468	A	M-S-P	4	V-8	6¼ x 6	410-500	1600-1800	B	....	A-E-G	T	....	76	42	73	5000
BXB	B	S-P	4	2	2⅞ x 3	7 7	1800	..	B-HM	H-E	....	....	19	17	17	131
NXA	B	S-P	4	2	3 x 4	10.5	1800	..	B-HM	H-E	....	....	21	18	19	270
NXB	B	S-P	4	2	3¼ x 4	12 5	1800	..	B-HM	H-E	....	....	21	18	19	270
GO-130	B	S-P	4	3	3½ x 4½	34	1800	..	B-HM	H-E	....	....	32	21	32	475
GO-149	B	S-P	4	3	3¾ x 4½	38	1800	..	B-HM	H-E	....	....	32	21	32	475
GO-169	B	S-P	4	3	4 x 4½	43	1800	..	B-HM	H-E	....	....	32	21	32	475
ZXA	B	S-P	4	4	2⅝ x 3	14 7	2500	..	B-HM	H-E	....	....	24	17	17	179
ZXB	B	S-P	4	4	2⅝ x 3	15.7	2500	..	B-HM	H-E	....	....	24	17	17	179
IXA	B	S-P	4	4	3 x 4	22.1	1800	..	B-HM	H-E	....	....	27	18	20	285
IXB	B	S-P	4	4	3¼ x 4	26.4	1800	..	B-HM	H-E	....	....	27	18	20	293
IXLB	B	S-P	4	4	3¼ x 4½	28	1800	..	B-HM	H-E	....	....	27	18	20	293
JX4E	B	S-P	4	4	3½ x 4¼	34.8	1800	..	B-HM	H-E	....	....	32	21	25	470
GO-173	B	S-P	4	4	3½ x 4½	40	1800	..	B-HM	H-E	....	....	31	22	33	500
JX4C	B	S-P	4	4	3⅝ x 4¼	40.2	1800	..	B-HM	H-E	....	....	32	21	25	470
GO-198	B	S-P	4	4	3¾ x 4½	46.5	1800	..	B-HM	H-E	....	....	31	22	33	500
JX4D	B	S-P	4	4	4 x 4¼	45 5	1800	..	B-HM	H-E	....	....	32	21	25	470
GO-226	B	S-P	4	4	4 x 4½	51.5	1800	..	B-HM	H-E	....	....	31	22	33	500
QXA	B	S-P	4	6	3¼ x 4½	37 8	1800	..	B-HM	H-E	....	....	36	18	21	440
QXB	B	S-P	4	6	3¼ x 4½	40.8	1800	..	B-HM	H-E	....	....	36	18	21	440
QXC	B	S-P	4	6	3¾ x 4½	46	1800	..	B-HM	H-E	....	....	36	18	21	440
QXD	B	S-P	4	6	3 7/16 x 4¼	48.5	1800	..	B-HM	H-E	....	....	36	18	21	440
QXLD	B	S-P	4	6	3 7/16 x 4¼	54.5	1800	..	B-HM	H-E	....	....	36	18	21	440
JXE	B	S-P	4	6	3¼ x 4¼	52.7	1800	..	B-HM	H-E	....	....	39	21	30	590
GO-260	B	S-P	4	6	3½ x 4½	60.5	1800	..	B-HM	H-E	....	....	40	22	34	650
JXB	B	S-P	4	6	3⅝ x 4¼	55.2	1800	..	B-HM	H-E	....	....	39	19	25	605
JXC	B	S-P	4	6	3⅝ x 4¼	60 4	1800	..	B-HM	H-E	....	....	39	19	25	605
GO-298	B	S-P	4	6	3¾ x 4½	69	1800	..	B-HM	H-E	....	....	40	22	34	650
JXD	B	S-P	4	6	4 x 4¼	69 7	1800	..	B-HM	H-E	....	....	39	19	25	605
JXLD	B	S-P	4	6	4 x 4¼	77 6	1800	..	B-HM	H-E	....	....	39	19	25	630
GO-339	B	S-P	4	6	4 x 4½	78	1800	..	B-HM	H-E	....	....	40	22	34	650
WXC3	B	S-P	4	6	4¼ x 4½	86	1800	..	B-HM	H-E-A	....	....	43	24	29	820
WXLC	B	S-P	4	6	4 x 4⅝	79	1800	..	B-HM	H-E-A	....	....	43	27	29	811
WXLC3	B	S-P	4	6	4¼ x 4⅝	89	1800	..	B-HM	H-E-A	....	....	43	27	29	825
TDXB	B	S-P	4	6	4⅜ x 5¼	106	1800	..	B-HM	H-E-A	....	....	48	28	35	1220
TDXC	B	S-P	4	6	4½ x 5¼	111	1800	..	B-HM	H-E-A	....	....	48	28	35	1220
RXB	B	S-P	4	6	4¼ x 5¼	98 5	1800	..	B-HM	H-E-A	....	....	47	27	33	1000
RXC & LC	B	S-P	4	6	4⅝ x 5¼	104-110 5	1800	..	B-HM	H-E-A	....	....	47	27	33	1010
RXLD & H	B	S-P	4	6	4⅝ x 5¼	116 5-125	1800	..	B-HM	H-E-A	....	....	47	26	36	1195
HXB	B	S-P	4	6	5 x 6	120	1600	..	B-HM	H-E-A	....	....	56	30	41	1810
HXC	B	S-P	4	6	5¼ x 6	132.5	1600	..	B-HM	H-E-A	....	....	56	30	41	1810
HXD	B	S-P	4	6	5½ x 6	155	1600	..	B-HM	H-E-A	....	....	56	30	41	1830
HXE	B	S-P	4	6	5⅝ x 6	176	1600	..	B-HM	H-E-A	....	....	56	30	41	1830

Engines have turbulence-chamber combustion system. Lengths measured from bellhousing face to front support. Heights measured from crankshaft to top of cylinder head cover. Weights are approximate and include engine with fuel handling equipment only and no other accessories not forming an integral part of the engine. Various mounting arrangements, flywheel housings, oil pans, manifolds, starting motor and generator locations are available to meet specific applications requirements. *Direct injection fuel system.

Ingersoll-Rand Company
11 Broadway, New York 4, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
T	A	M-S-P	4	6	7 x 8½	220	1000	O	....	A-E	....	*	86	45	69	....
T	A	M-S-P	4	8	7 x 8½	290	1000	O	....	A-E	....	*	108	45	69	....
TS	A	M-S-P	4	6	7 x 8½	350	1000	O	....	A-E	T	*	86	48	69	....

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
T8	A	M-S-P	4	8	7 x 8¼	465	1000	O	....	A-E	T	*	108	48	69	....
8	A	M-S-P	4	5	10¼ x 12	375	750	O	....	A-E	....	*	116	49	85	....
8	A	M-S-P	4	6	10¼ x 12	450	750	O	....	A-E	....	*	132	49	85	..
8	A	M-S-P	4	7	10¼ x 12	525	750	O	....	A-E	....	*	149	49	85	....
8	A	M-S-P	4	8	10¼ x 12	600	750	O	....	A-E	....	*	165	49	85	....
8S	A	M-S-P	4	5	10¼ x 12	580	750	O	....	A-E	T	*	116	53	85	....
8S	A	M-S-P	4	6	10¼ x 12	750	750	O	....	A-E	T	*	132	53	85	....
8S	A	M-S-P	4	7	10¼ x 12	825	750	O	....	A-E	T	*	149	53	85	....
8S	A	M-S-P	4	8	10¼ x 12	1000	750	O	....	A-E	T	*	165	53	85	....

* Reverse & Reduction Gear varies.

International Harvester Company
180 No. Michigan Avenue, Chicago 1, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
UD-281	A	S-P	4	4	4½ x 5¼	60*	1800	O	....	E-G	....	....	38	25	47	1800
UD-350	A	S-P	4	4	4½ x 5½	75*	1800	O	....	E-G	....	....	40	27	54	2073
UD-14A	A	S-P	4	4	4⅝ x 6½	100*	1800	O	....	E-G	....	....	52	33	57	2642
UD-625	A	S-P	4	6	4½ x 5½	115*	1800	O	....	E-G	....	....	68	36	57	3127
UD-18A	A	S-P	4	6	4⅝ x 6½	150*	1800	O	....	E-G	....	....	72	36	60	3840
UD-1091	A	S-P	4	6	5¾ x 7	200*	1500	O	....	E-G	....	....	84	44	72	5480
U-123	B	S-P	4	4	3½ x 4	23.4*	2000	..	B	E	....	....	49	25	41	730
U-175	B	S-P	4	4	3⅝ x 4¼	46.2*	2000	..	B	E	....	....	56	24	39	975
U-281	B	S-P	4	4	4½ x 5¼	65.5*	1800	..	B	E	....	....	63	29	48	1500
U-220	B	S-P	4	6	3 15/16 x 3 11/16	58.1*	2400	..	B	E	....	....	64	28	50	1243
U-264-6	B	S-P	4	6	3 11/16 x 4½	68.5*	2400	..	B	E	....	....	64	28	50	1260
U-308	B	S-P	4	6	3 11/16 x 4½	78.5*	2400	..	B	E	....	....	65	28	50	1390
U-372	B	S-P	4	6	4⅜ x 4⅛	87.5*	2200	..	B	E	....	....	71	28	57	1808
U-450	B	S-P	4	6	4⅝ x 5	105*	2200	..	B	E	....	....	73	28	57	1938
U-501	B	S-P	4	6	4½ x 5¼	113.5*	2200	..	B	E	....	....	73	28	57	5500
U-1091	B	S-P	4	6	5¾ x 7	200*	1600	..	B	E	....	....	108	44	64	5500

*Diesel engines: Horsepower shown is for complete power unit with radiator & fan as obtained at sea level with regular production injection pump setting. Dimensions and weights from front of radiator to back face of flywheel housing and do not include power take-off attachment. *Intermittent rating.*

Kahlenberg Brothers Company
1707-12th Street
Two Rivers, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AD	A	M-S	2	2	8¼ x 9	30-36	400	O	....	A	....	O	...	...	...	5450
AT	A	M-S	2	3	8¼ x 9	45-54	400	O	....	A	....	O-D	...	...	...	6500
AF	A	M-S	2	4	8¼ x 9	60-70	400	O	....	A	....	O-D	...	...	...	8200
BD	A	M-S	2	2	10 x 10½	50-60	375	O	....	A	....	O	...	...	...	7300
BT	A	M-S	2	3	10 x 10½	90	375	O	....	A	....	†D	...	...	...	9700
BF	A	M-S	2	4	10 x 10½	120	375	O	....	A	....	†D	...	...	...	11980
B5	A	M-S	2	5	10 x 10½	150	375	O	....	A	....	†D	...	...	...	15650
B6	A	M-S	2	6	10 x 10½	180	375	O	....	A	....	D	...	...	...	17050
CT	A	M-S	2	3	12½ x 14	150	325	O	....	A	....	†D	...	...	...	21730
CF	A	M-S	2	4	12½ x 14	200	325	O	....	A	....	†D	...	...	...	23900
C5	A	M-S	2	5	12½ x 14	250	325	O	....	A	....	D	...	...	...	29960
C6	A	M-S	2	6	12½ x 14	300	325	O	....	A	....	D	...	...	...	34000
E4	A	M-S	2	4	10½ x 16	400-532	300-400	..	....	A	T	†D	115	76	79	22000
E5	A	M-S	2	5	10½ x 16	500-665	300-400	..	....	A	T	D	130	76	79	26000
E6	A	M-S	2	6	10½ x 16	600-800	300-400	..	....	A	T	D	146	76	79	30000
E7	A	M-S	2	7	10½ x 16	700-930	300-400	..	....	A	T	D	162	76	79	34000
E8	A	M-S	2	8	10½ x 16	800-1065	300-400	..	....	A	T	D	177	76	79	38000

† *Reduction gear optional.*

The Lathrop Engine Division
Burmeister & Wain American Corporation
Mystic, Conn.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D-60	A	M	4	4	5½ x 7	60	900	B	....	E	....	O	75	29	31	3000
D-120	A	M	4	6	5½ x 7	120	1100	B	....	E	....	S	108	31	31	4100

LeRoi Division
Westinghouse Air Brake Co.
1706 South 68th Street, Milwaukee 14, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D226	B	S-P	4	4	4 x 4½	40.5	1800	..	HM*	E-H	....	....	54	25	48	850†
A288	B	S	4	1	7¼ x 7	17	720	..	HM*	E-H	....	....	64	47	54	2300†
A114	B	S	4	1	5¾ x 5¼	11.9	1200	..	HM*	E-H	....	....	47	49	51	1530†
H540	B	S-P	4	8	4½ x 4⅛	140	2400	..	HM*	E-A	....	....	81	40	64	2000†
H844	B	S-P	4	8	5¼ x 4¾	190	2200	..	HM*	E-A	....	....	88	50	74	3200
F1500	B	S-P	4	6	6¾ x 7	159	1100	..	HM**	G-A-E	....	....	115	50	84	5800
H2000	B	S	4	8	6¾ x 7	213	1100	..	HM**	G-A-E	....	....	88	52	72	5850
L3000	B	S	4	12	6¾ x 7	324	1100	..	HM**	G-A-E	....	....	111	60	84	8300
L3460	B	S	4	12	7¼ x 7	445	1200	..	HM**	G-A-E	....	....	167	66	86	12800
L4000	B	S	4	12	7 54 x 7 5	493	1200	..	HM**	G-A-E	....	....	169	66	91	12850

* *Distributor available.* ** *LM available.* † *Lighter automotive units available. Weights are given for stationary units (dry).*

Lufkin Foundry & Machine Co.
Lufkin, Texas

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
H333	B	S	2	2	5½ x 7	20–30	425–650	..	HM	E-A	..	....	59	53	52	3200
H796	B	S	2	2	7½ x 9	45–65	400–600	..	HM	E-A	....	....	76	68	60	4250

Mack Trucks Inc.
1355 W. Front St., Plainfield, New Jersey

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
ENDT673	A	P	4	6	4¼ x 6	170	2100	B	....	E-A		....	51	27	45	1917
ENDL673	A	P	4	6	4⅛ x 6	170	2100	B	....	E-A	....	....	51	27	45	1837
ENDT673	A	P	4	6	4¼ x 6	205	2100	B	....	E-A	T	....	51	31	45	2032
ENDLT673	A	P	4	6	4⅛ x 6	205	2100	B	....	E-A	T	....	51	31	45	1952

Minneapolis-Moline Company
Minneapolis 1, Minnesota

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
206H-4A	B	S-P	4	4	3⅝ x 5	21–45	800–1500	..	B-HM	E	....	....	38	21	36	900
283-4A	D	S-P	4	4	4¼ x 5	32–59	800–1400	B	B-HM	E	....	....	46	25	46	1400
403-4A	B	S-P	4	4	4⅝ x 6	52–79	800–1300	..	B-HM	E	....	....	46	25	46	1590
425A-6A	D	S-P	4	6	4¼ x 5	48–85	800–1400	B	B-HM	E	....	....	60	25	48	2100
605A-6A	D	S-P	4	6	4⅝ x 6	72–100	800–1200	B	B-HM	E	....	....	60	29	54	2500
800-6A	B	S-P	4	6	5 5/16 x 6	98–148	800–1300	.	B-HM	E	....	....	60	29	54	3125
D283-4A	A	S-P	4	4	4¼ x 5	28–46	800–1300	B	....	E	....	....	....	....	....	.....
D425-6A	A	S-P	4	6	4¼ x 5	42–77	800–1400	B	....	E	....	....	....	....	....	.....
D605-6A	A	S-P	4	6	4⅞ x 6	66–95	800–1400	B	....	E	....	....	....	....	....	.....

Note: Type "B" engine includes gasoline, natural gas, LPG and tractor fuel.

Murphy Diesel Company
5317 West Burnham Street, Milwaukee, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
ME4	A	P-M	4	4	5¾ x 6½	96	1200	O	....	E-GA	....	....	71	43	65	3800
11	A	P-M	4	4	5¾ x 6½	107–133	1200–1400	O	....	E-GA	*	....	71	43	65	3800–3850
12	A	P-M	4	4	6 x 6½	117–144	1200–1400	O	....	E-GA	*	....	71	43	65	3800–3850
20	C	P-M	4	6	5½ x 6½	144–157	1200–1400	O	....	E-GA	....	....	93	43	65	4700
120	A	P-M	4	6	5½ x 6½	155–170	1200–1400	O	....	E-GA	*	....	93	43	65	4800
21	C	P-M	4	6	5¾ x 6½	161–173	1200–1400	O	....	E-GA	....	....	93	43	65	4700
22	C	P-M	4	6	6 x 6½	177–205	1200–1400	O	....	E-GA	....	....	93	43	65	4700
121	A	P-M	4	6	5¾ x 6½	182–197	1200–1400	O	....	E-GA	*	....	93	43	65	4800
122	A	P-M	4	6	6 x 6½	192–220	1200–1400	O	....	E-GA	*	....	93	43	65	4800
24	C	P-M	4	6	6¾ x 6½	198–216	1200–1400	O	....	E-GA	....	....	93	43	65	4700
324	A	P-M	4	6	6¾ x 6½	225–243	1200–1400	O	....	E-GA	*	....	93	43	65	4800

** Turbo-supercharging manifold. All engines have open-type combustion chambers and unit injectors. Marine engines carry different model numbers, weights and dimensions. Ratings shown are with power consuming accessories and corrected to 29.92-in & 60°F.*

Nordberg Manufacturing Co.
Milwaukee, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
4FS-1	A	S-P	4	1	4½ x 5¼	10–15	1200–1800	B	....	E-H	....	....	....	....	....	.....
4FG-1	B	S	4	1	4½ x 5¼	8–18	800–1800	..	HM	E-H	....	....	....	....	....	.....
4FS-2	A	S-P	4	2	4½ x 5¼	20–30	1200–1800	B	....	E-H	....	....	....	....	....	.....
4FG-2	B	S	4	2	4½ x 5¼	16–36	800–1800	..	HM	E-H	....	....	....	....	....	.....
4FS-3	A	S-P	4	3	4½ x 5¼	30–45	1200–1800	B	....	E-H	....	....	....	....	....	.....
FS-96-HSC*	D	M-S	4	6	9 x 11½	640	720	S	LM	A	T	D	....	....	....	.....
FS-98-HSC*	D	M-S	4	8	9 x 11½	850	720	S	LM	A	T	D	....	....	....	.....
FS-135-HSC*	D	S	4	5	13–13½ x 16½	1000–1350	450–514	S	P	A	T	....	....	....	....	.....
FS-136-HSC*	D	S	4	6	13–13½ x 16½	1200–1625	450–514	S	P	A	T	D	....	....	....	.....
FS-137-HSC*	D	S	4	7	13–13½ x 16½	1400–1900	450–514	S	P	A	T	D	....	....	....	.....
FS-138-HSC*	D	S	4	8	13–13½ x 16½	1600–2175	450–514	S	P	A	T	D	....	....	....	.....
FS-1310-HSC*	D	S	4	10	13–13½ x 16½	2000–2500	450–514	S	P	A	T	D	....	....	....	.....
FS-1312-HSC*	D	S	4	12	13–13½ x 16½	2400–3000	450–514	S	P	A	T	D	....	....	....	.....
FS-1316-HSC*	D	S	4	16	13–13½ x 16½	3200–4000	450–514	S	P	A	T	D	....	....	....	.....
RTS**-1412	D	M-S	2	12	14 x 16	2125–2520	400–450	B	P	A	....	....	....	....	....	.....
TS-215-31	C	M-S	2	5	21½ x 31	2550–2925	240–257	B	....	A	....	D	....	....	....	.....
TS-216-31	C	M-S	2	6	21½ x 31	3050–3500	240–257	B	....	A	....	D	....	....	....	.....
TS-217-31	C	M-S	2	7	21½ x 31	3575–4100	240–257	B	....	A	....	D	....	....	....	.....
TS-218-31	C	M-S	2	8	21½ x 31	4075–4675	240–257	B	....	A	....	D	....	....	....	.....
TS-219-31	C	M-S	2	9	21½ x 31	4600–5275	240–257	B	....	A	....	D	....	....	....	.....
TS-2110-31	C	M-S	2	10	21½ x 31	5100–5850	240–257	B	....	A	....	D	....	....	....	.....
TS-2112-31	C	M-S	2	12	21½ x 31	6150–7025	240–257	B	....	A	....	D	....	....	....	.....
TS-296	C	M-S	2	6	29 x 40	5670–6400	189–200	B	....	A	....	D	....	....	....	.....
TS-297	C	M-S	2	7	29 x 40	6620–7500	189–200	B	....	A	....	D	....	....	....	.....
TS-298	C	M-S	2	8	29 x 40	7570–8500	189–200	B	....	A	....	D	....	....	....	.....
TS-299	C	M-S	2	9	29 x 40	8500–9600	189–200	B	....	A	....	D	....	....	....	.....
TS-2910	C	M-S	2	10	29 x 40	9450–10600	189–200	B	....	A	....	D	....	....	....	.....
TS-2912	C	M-S	2	12	29 x 40	11350–12800	189–200	B	....	A	....	D	....	....	....	.....

* Supairthermal execution.

** Radial engine. Engines are designed to operate continuously at ratings shown and are good for 10 per cent overload for 2 hr in any 24 hr period.

Oliver Corporation
400 W. Madison St., Chicago, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
Super 166D	A	S-M-P	4	4	3½ x 3¾	28.1	1800	B	....	E	....	*	40	22	39	781
Super 177D	A	S-M-P	4	6	3½ x 3¾	39.0	1800	B	....	E	....	*	49	22	39	950
Super 188D	A	S-M-P	4	6	3¾ x 4	48.0	1800	B	....	E	....	*	52	24	47	1108
Super 199D	A	S-M-P	4	6	4 x 4	57.0	1800	B	....	E	....	*	52	24	47	1165
Super 166HC	B	S-P	4	4	3½ x 3¾	28.1	1800	..	B-HM	E	....	*	40	22	39	728
Super 177HC	B	S-P	4	6	3½ x 3¾	40.6	1800	..	B-HM	E	....	*	49	22	39	913
Super 188HC	B	S-P	4	6	3¾ x 4	49.0	1800	..	B-HM	E	....	*	52	24	47	1035
Super 199HC	B	S-P	4	6	4 x 4	57.1	1800	..	B-HM	E	....	*	52	24	47	1088

**Reverse Gear Available*

Rathbun-Jones Engineering Company
Toledo, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
18	C	S	4	3	11 x 18	220	450	O	....	A	....	....	158	70	106	26000
18	C	S	4	4	11 x 18	290	450	O	....	A	....	....	177	70	106	31500
18	C	S	4	5	11 x 18	364	450	O	....	A	....	....	196	70	106	36300
18	C	M-S	4	6	11 x 18	435	450	O	....	A	....	D	215	70	106	41200
18	C	M-S	4	7	11 x 18	510	450	O	....	A	....	D	238	70	106	46000
18	C	M-S	4	8	11 x 18	580	450	O	....	A	....	D	258	70	106	51000
22	C	S	4	3	15½ x 22	388	327	O	....	A	....	....	175	80	126	41500
22	C	S	4	4	15½ x 22	518	327	O	....	A	....	....	197	80	126	50000
22	C	S	4	5	15½ x 22	650	327	O	....	A	....	....	225	80	126	58500
22	C	M-S	4	6	15½ x 22	775	327	O	....	A	....	D	247	80	126	68000
22	C	M-S	4	7	15½ x 22	910	327	O	....	A	....	D	271	80	126	75500
22	C	M-S	4	8	15½ x 22	1035	327	O	....	A	....	D	293	80	126	85000
21	C	S	4	3	18¼ x 24	540	300	O	....	A	....	....	200	85	140	60000
21	C	S	4	4	18¼ x 24	720	300	O	....	A	....	....	231	85	140	74000
24	C	S	4	5	18¼ x 24	900	300	O	....	A	....	....	258	85	140	87000
24	C	M-S	4	6	18¼ x 24	1080	300	O	....	A	....	D	294	85	140	98000
24	C	M-S	4	7	18¼ x 24	1260	300	O	....	A	....	D	321	85	140	110000
24	C	M-S	4	8	18¼ x 24	1440	300	O	....	A	....	D	348	85	140	120000
28	C	S	4	5	19½ x 28	1025	257	O	....	A	....	....	332	104	171	140000
28	C	M-S	4	6	19½ x 28	1230	257	O	....	A	....	D	339	104	171	164000
28	C	M-S	4	7	19½ x 28	1435	257	O	....	A	....	D	380	104	171	187000
28	C	M-S	4	8	19½ x 28	1640	257	O	....	A	....	D	409	104	171	212000
28	C	S	4	10	19½ x 28	2050	257	O	....	A	....	....	460	104	171	230000
28	C	S	4	12	19½ x 28	2460	257	O	....	A	....	....	528	104	171	260000

Engines have Price turbulence chamber combustion system and Rathbun distributor type fuel injection system. Lengths listed are approximate for stationary engines and include generator, exciter drive and outboard bearing. Widths include operating platforms. Marine lengths, including thrust bearing, are considerably shorter. Weights are for stationary units.

R. H. Sheppard Company, Inc.
Hanover, Pennsylvania

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
17A	A	M-S-P	4	2	3½ x 4	13.5	1800	O	....	E	....	*	25	18	26	435
19	A	M-S-P	4	4	3½ x 4	28	1800	O	....	E	....	*	43	39	18	600
16	A	M-S-P	4	4	4½ x 5	54	1800	O	....	E	....	*	65	22	46	1725

**Optional*

Sterling Engine Company, Inc.
Menominee, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AB-6	A	M-S	4	6	4⅛ x 5¾	72-110	1400-1800	B	....	E	....	S	58	30	53	3150
DB-6	A	M-S	4	6	5⅛ x 7	114-170	1200-1500	B	....	E	....	S	60	36	60	5200
DB-8	A	M-S	4	8	5⅛ x 7	152-230	1200-1500	B	....	E	....	S	75	36	60	6850
VD-6	A	M-S	4	6	8 x 9	420	1200	B-S	....	A-E	....	S-T	95	40	64	8500
VD-6-S	A	M-S	4	6	8 x 9	750	1200	B	....	A-E	T	S	115	40	64	9160
VD-8-S	A	S	4	8	8 x 9	1000	1200	B	....	A-E	T	....	136	40	64	12450
LC-6	B	S	4	6	5¼ x 6	72-110	800-2000	..	B	E	....	....	57	33	42	2200
TC-6	B	S	4	6	8 x 9	260-450	700-1200	..	B	A-E	....	....	101	45	64	6900
TC-8	B	S	4	8	8 x 9	365-600	700-1200	..	B	A-E	....	....	122	45	64	9000

Weights and dimensions are given for "S" units. Horsepower listings indicate continuous and intermittent ratings.

Union Diesel Engine Company
Oakland 6, Calif.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
GA6	D	M-S	4	6	8½ x 11	150-240	475-600	O	....	A	....	D	114	34	72	12500
GA6S	D	M-S	4	6	8½ x 11	225-350	475-600	O	....	A	T	D	117	34	72	13500
L6	D	M-S	4	6	10 x 14	230-335	350-514	O	....	A	....	D	135	42	85	20000
L6S	D	M-S	4	6	10 x 14	300-530	350-514	O	....	A	T	D	135	42	85	21000
P6	D	M-S	4	6	12 x 15	380-575	400-514	O	....	A	....	D	162	46	93	34500
P6S	D	M-S	4	6	12 x 15	525-800	400-514	O	....	A	T	D	166	46	93	36000
V6	D	M-S	4	6	14 x 19	450-750	300-400	O	....	A	....	D	185	57	114	53000
V6S	D	M-S	4	6	14 x 19	750-1100	300-400	O	....	A	T	D	185	57	114	54500
Z6	D	M-S	4	6	16 x 20½	600-925	240-360	O	....	A	....	D	203	62	125	80000
Z6S	D	M-S	4	6	16 x 20½	750-1400	240-360	O	....	A	T	D	203	62	125	82000
GA8	D	M-S	4	8	8½ x 11	200-310	450-600	O	....	A	....	D	144	34	72	16000
GA8S	D	M-S	4	8	8½ x 11	300-460	450-600	O	....	A	T	D	151	34	72	17000
L8	D	M-S	4	8	10 x 14	255-445	350-514	O	....	A	....	D	171	42	85	26000
L8S	D	M-S	4	8	10 x 14	400-700	350-514	O	....	A	T	D	171	42	85	26500
P8	D	M-S	4	8	12 x 15	450-700	400-514	O	....	A	....	D	198	46	93	45000
P8S	D	M-S	4	8	12 x 15	750-1150	400-514	O	....	A	T	D	202	46	93	46500
V8	D	M-S	4	8	14 x 19	600-1000	300-400	O	....	A	....	D	234	57	114	70000
V8S	D	M-S	4	8	14 x 19	900-1400	300-400	O	....	A	T	D	234	57	114	72000
Z8	D	M-S	4	8	16 x 20½	750-1200	240-360	O	....	A	....	D	259	62	125	98000
Z8S	D	M-S	4	8	16 x 20½	1050-1875	240-360	O	....	A	T	D	259	62	125	100000

Venn Severin Engine Works, Inc.
12822 Simms Ave., Hawthorne, Calif.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
HCL-2	A	M-S-P	2	2	7 x 8	60	900	B	....	AE	....	TS	47	35	62	3500
HCL-3	A	M-S-P	2	3	7 x 8	90	900	B	....	AE	....	TS	56	35	62	4500
308V4	A	M-S-P	2	V-4	7 x 8	180	1000	B	....	AE	....	TS	81	44	54	4800
308V6	A	M-S-P	2	V-6	7 x 8	270	1000	B	....	AE	....	TS	94	44	54	5500

Waukesha Motor Company
Waukesha, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
ICK	B	S-P	4	4	2½ x 3½	14*	2000	..	B-HM	H-E	....	....	22	13	21	195
FC	B	S-P	4	4	3¼ x 4	26*	1800	..	B-HM	H-E	....	....	28	19	21	290
180GLB	B	S-P	4	4	3½ x 3¾	34†*	2000	..	B-HM	H-E	....	....	31	19	28	450
180DLC	A	S-P	4	4	3½ x 3¾	31†*	2000	B	....	H-E	....	....	31	19	28	475
XAH	B	S-P	4	4	3½ x 4½	35*	1800	..	B-HM	H-E	....	....	33	19	27	385
185GLB	B	S-P	4	6	3½ x 3¾	50*	2000	..	B-HM	H-E	....	....	31	22	30	675
185DLC	A	S-P	4	6	3½ x 3¾	44*	2000	B	....	H-E	....	....	31	22	30	675
190GLB	B	S-P	4	6	3¾ x 4	60*	2000	..	B-HM	H-E	....	....	43	22	30	690
190DLCA	A	S-P	4	6	3¾ x 4	58†*	2000	B	....	H-E	....	....	43	22	29	768
195GL	B	S-P	4	6	4 x 4	65*	2000	..	B-HM	H-E	....	....	43	22	30	775
195DLCA	A	S-P	4	6	4 x 4	67†*	2000	B	....	E	....	....	43	26	30	865
197-DLCS	A	S-P	4	6	4 x 4	94*	2200	R	....	H-E	T	....	44	26	40	890
195GK	B	S-P	4	6	4¼ x 4	71*	2000	..	B-HM	H-E	....	....	44	22	30	780
195-GKA	B	S-P	4	6	4¼ x 4	73†*	2000	..	B-HM	H-E	....	....	44	22	30	800
MZA	B	S-P	4	6	4¼ x 4¾	77*	1600	..	B-HM	H-E	....	....	44	21	34	920
135-CKB	B	S-P	4	6	4¼ x 5	98†*	2000	..	B-HM	E	....	....	47	26	38	1325
136DKB	A	S-P	4	6	4¼ x 5	99†*	2000	B	....	E	....	....	48	26	35	1386
135DKBS	A	S-P	4	6	4¼ x 5	121†*	2000	B	....	E	T	....	48	26	41	1486
135C-ZB	B	S-P	4	6	4½ x 5	104†*	2000	..	B-HM	E	....	....	48	26	38	1325
140GKB	B	S-P	4	6	4½ x 5½	112†*	1800	..	B-HM	E	....	....	52	26	43	1390
140-GZB	B	S-P	4	6	4½ x 5½	117†*	1800	..	B-HM	E	....	....	52	26	43	1390
145GKB	B	S-P	4	6	5¼ x 6	160†*	1800	..	B-HM	E-G	....	....	56	29	47	1810
148DKB	A	S-P	4	6	5¼ x 6	147†*	1800	B	....	E-G	....	....	56	29	47	2320
148DKBS	A	S-P	4	6	5¼ x 6	194†*	1800	B	....	E-G	T	....	56	29	56	2445
145GZB	B	S-P	4	6	5¼ x 6	167†*	1800	..	B-HM	E-G	....	....	56	29	47	1820
WAKB	B	S-P	4	6	6¼ x 6½	227†*	1600	..	HM	E-G	....	....	67	33	51	3150
WAKR	B	S-P	4	6	6¼ x 6½	217†*	1600	..	HM	E-G	....	....	67	33	51	3050
WAKDB	A	S-P	4	6	6¼ x 6½	195†*	1600	B	....	E-G	....	....	67	33	51	3800
WAKDBS	A	S-P	4	6	6¼ x 6½	259†*	1600	B	....	E-G	T	....	67	33	63	3925
NKRB	B	S-P	4	6	7 x 8¼	260*†	1200	..	HM	G	....	....	79	48	61	6900
NKDB	A	S-P	4	6	7 x 8¼	238†*	1200	B	....	G	....	....	79	48	61	9285
NKDBS	A	S-P	4	6	7 x 8¼	312†*	1200	B	....	G	T	....	79	48	61	9435
LRORB	B	S-P	4	6	8½ x 8½	372†*	1200	..	HM	G	....	....	98	49	70	9940
LRDB	A	S-P	4	6	8½ x 8½	332†*	1200	B	....	G	....	....	98	49	70	10300
LRDBS	A	S-P	4	6	8½ x 8½	456†*	1200	B	....	G	T	....	114	49	70	10450
LRZB	B	S-P	4	6	9½ x 8½	475†*	1200	..	HM	G	....	....	114	60	73	11250
VLROB	B	S-P	4	12	8½ x 8½	720†*	1200	..	HM	G	....	....	130	60	58	15000
VLRDB	A	S-P	4	12	8½ x 8½	664†*	1200	B	....	G	....	....	130	60	58	15500
VLRDBS	A	S-P	4	12	8½ x 8½	908†*	1200	B	....	G	T	....	134	60	58	16300

* *Continuous hp ratings are based on 80 per cent of maximum at speeds indicated. Gas ratings on LPG; natural gas approx. 10 per cent lower.*
† *Counter balanced crankshaft.*

White Diesel Engine Division
The White Motor Company
Springfield, Ohio

Superior Engines

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
#G-510	B	S-P	4	6	8¼ x 9	190-370	600-1200		HM	A-G	....	....	...	...	...	.....
40-6	A	M-S-P	4	6	8½ x 10½	215-425	600-1000	B-S	....	A	....	....	...	...	...	.....
40-8	A	M-S-P	4	8	8½ x 10½	290-570	600-1000	B-S	....	A	....	....	...	...	...	.....
40X-6	A	M-S-P	4	6	8½ x 10½	325-700	600-1000	B-S	....	A	T	....	...	...	...	.....
40X-8	A	M-S-P	4	8	8½ x 10½	435-940	600-1000	B-S	....	A	T	....	...	...	...	.....
40C-6	A	M-S-P	4	6	8½ x 10½	240-460	700-1100	B-S	....	A	....	....	...	...	...	.....
40C-8	A	M-S-P	4	8	8½ x 10½	325-620	700-1100	B-S	....	A	....	....	...	...	...	.....
40C-X-6	A	M-S-P	4	6	8½ x 10½	450-775	700-1100	B-S	....	A	T	....	...	...	...	.....
40C-X-8	A	M-S-P	4	8	8½ x 10½	635-1025	700-1100	B-S	....	A	T	....	...	...	...	.....
6G-825	B	S-P	4	6	10 x 10½	300-450	600-900	..	HM	A	....	....	...	...	...	.....
8G-825	B	S-P	4	8	10 x 10½	400-600	600-900	..	HM	A	....	....	...	...	...	.....
60-6	C	M-S	4	6	12 x 15	410-530	400-514	B	....	A	....	....	...	...	...	.....
60-8	C	M-S	4	8	12 x 15	515-705	400-514	B	....	A	....	....	...	...	...	.....
60X-6	C	M-S	4	6	12 x 15	615-950	400-514	S	....	A	T	....	...	...	...	.....
60X-8	C	M-S	4	8	12 x 15	875-1250	400-514	S	....	A	T	....	...	...	...	.....
65-6	C	M-S	4	6	12¾ x 15	580-720	500-600	S	....	A	....	....	...	...	...	.....
65-8	C	M-S	4	8	12¾ x 15	775-960	500-600	S	....	A	....	....	...	...	...	.....
65X-6	C	M-S	4	6	12¾ x 15	1105-1600	500-600	S	....	A	T	....	...	...	...	.....
65X-8	C	M-S	4	8	12¾ x 15	1470-2150	500-600	S	....	A	T	....	...	...	...	.....
80-6	D	M-S	4	6	14½ x 20	600-780	300-375	S	HM	A	....	....	...	...	...	.....
80-8	D	M-S	4	8	14½ x 20	800-1040	300-375	S	HM	A	....	....	...	...	...	.....
80X-6	C	M-S	4	6	14½ x 20	900-1400	300-375	S	....	A	T	....	...	...	...	.....
80X-8	C	M-S	4	8	14½ x 20	1200-1900	300-375	S	....	A	T	....	...	...	...	.....

Atlas Engines

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
35-4	A	M-S-P	4	4	6½ x 8¼	100–110	900–1000	B	....	A-E	....	....	....	....	....	.....
35-6	A	M-S-P	4	6	6½ x 8¼	150–225	900–1250	B	....	A-E	....	....	....	....	....	.....
35X-6	A	M-S-P	4	6	6½ x 8¼	225–340	900–1250	B	....	A-E	T	....	....	....	....	.....
45-4	A	M-S-P	4	4	9 x 10½	160–190	600–720	B-S	....	A	....	....	....	....	....	.....
45-6	A	M-S-P	4	6	9 x 10½	240–300	600–750	B-S	....	A	....	....	....	....	....	.....
45-8	A	M-S-P	4	8	9 x 10½	320–400	600–750	B-S	....	A	....	....	....	....	....	.....
45X-6	A	M-S-P	4	6	9 x 10½	360–450	600–750	B-S	....	A	T	....	....	....	....	.....
45X-8	A	M-S-P	4	8	9 x 10½	480–600	600–750	B-S	....	A	T	....	....	....	....	.....
76-6	A	S	4	6	13 x 16	450–500	360–400	B	....	A	....	....	....	....	....	.....
76X-6	A	S	4	6	13 x 16	675–750	360–400	B	....	A	T	....	....	....	....	.....

White-Roth Machine Corporation—Lorain Engines
Lorain, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
L	B	S	2	1	7½ x 8	27	600	..	HM	H-G	....	....	72	50	48	2810
LD	A	S	2	1	7½ x 8	23	600	S	....	G	....	....	72	50	48	2810
O	B	S	2	1	9½ x 10	42	500	..	HM	H-G	....	....	88	60	51	4300
OD	A	S	2	1	9½ x 10	34	500	S	....	G	....	....	88	60	51	4300
R	B	S	2	1	12 x 13	60	350	..	HM	G	....	....	112	71	66	8000
A	B	S	2	1	13 x 13	70	350	..	HM	G	....	....	112	72	66	8300
AD	A	S	2	1	13 x 13	55	350	S	....	G	....	....	112	72	66	8500

Witte Engine Works
Oil Well Supply Division, U. S. Steel Corporation
Kansas City 26, Missouri

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AD	A	S-P	4	1	3¼ x 4½	4–5.5	1200–1500	B	....	H-E	....	....	24	24	33	450
LD	A	S-P	4	1	4½ x 5¼	9	1350	B	....	H-E	....	....	35	26	43	975
BD	A	S-P	4	1	4¼ x 6	8	900	B	....	H-E	....	....	45	39	42	1150
CD	A	S-P	4	1	5 x 8	12.5	750	B	....	H-E	....	....	53	49	49	1735
F-25	B	S-P	4	1	8 x 8	25	625	..	HM	E-G	....	....	62	53	54	3000
B	B	S-P	4	1	5 x 6	10	900	..	HM	H-E	....	....	47	39	42	1285
C	B	S-P	4	1	6 x 8	15.5	750	..	HM	H-E	....	....	57	47	49	1760
98	B	S-P	4	1	5 x 5	10	1200	..	HM	H-E	....	....	39	36	36	655
100	A	M-S-P	4	2	4 x 4	18.0	1800	B-R	....	E	....	....	29	39	26	700

Worthington Corporation
Harrison, New Jersey

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
SW9-6	D	S-P	4	6	9 x 11	955	900	..	....	A	T	....	....	....	....	.....
SW9-8	D	S-P	4	8	9 x 11	1275	900	..	....	A	T	....	....	....	....	.....
DH6	D	S-P	4	6	12 x 14	610	600	..	....	A	....	....	....	....	....	.....
DH8	D	S-P	4	8	12 x 14	815	600	..	....	A	....	....	....	....	....	.....
SDH6	D	S-P	4	6	12 x 14	990	600	..	....	A	T	....	....	....	....	.....
SDH8	D	S-P	4	8	12 x 14	1325	600	..	....	A	T	....	....	....	....	.....
SCC5	D	S	4	5	10¼ x 14½	515	514	..	....	A	T	....	....	....	....	.....
SCC6	D	S	4	6	10¼ x 14½	615	514	..	....	A	T	....	....	....	....	.....
SCC7	D	S	4	7	10¼ x 14½	720	514	..	....	A	T	....	....	....	....	.....
SCC8	D	S	4	8	10¼ x 14½	825	514	..	....	A	T	....	....	....	....	.....
DR5	D	S	4	5	13¼ x 17½	580	450	..	....	A	....	....	....	....	....	.....
DR6	D	S	4	6	13¼ x 17½	700	450	..	....	A	....	....	....	....	....	.....
DR7	D	S	4	7	13¼ x 17½	815	450	..	....	A	....	....	....	....	....	.....
DR8	D	S	4	8	13¼ x 17½	930	450	..	....	A	....	....	....	....	....	.....
SDR5	D	S	4	5	13¼ x 17½	1030	450	..	....	A	T	....	....	....	....	.....
SDR6	D	S	4	6	13¼ x 17½	1235	450	..	....	A	T	....	....	....	....	.....
SDR7	D	S	4	7	13¼ x 17½	1415	450	..	....	A	T	....	....	....	....	.....
SDR8	D	S	4	8	13¼ x 17½	1645	450	..	....	A	T	....	....	....	....	.....
EH5	C	S	4	5	16 x 20	775	360	..	....	A	....	....	....	....	....	.....
EH6	C	S	4	6	16 x 20	935	360	..	....	A	....	....	....	....	....	.....
EH7	C	S	4	7	16 x 20	1090	360	..	....	A	....	....	....	....	....	.....
EH8	C	S	4	8	16 x 20	1245	360	..	....	A	....	....	....	....	....	.....
SEH5	D	S	4	5	16 x 20	1375	360	..	....	A	T	....	....	....	....	.....
SEH6	D	S	4	6	16 x 20	1650	360	..	....	A	T	....	....	....	....	.....
SEH7	D	S	4	7	16 x 20	1925	360	..	....	A	T	....	....	....	....	.....
SEH8	D	S	4	8	16 x 20	2200	360	..	....	A	T	....	....	....	....	.....
SW14-6	D	S	4	6	14 x 18	1875	450	..	....	A	T	....	....	....	....	.....
SW14-8	D	S	4	8	14 x 18	2500	450	..	....	A	T	....	....	....	....	.....
SW14-12	D	S	4	12	14 x 18	3750	450	..	....	A	T	....	....	....	....	.....
SW14-16	D	S	4	16	14 x 18	5000	450	..	....	A	T	....	....	....	....	.....
CCG5	B	S-P	4	5	12¼ x 14½	445	514	..	....	A	....	....	....	....	....	.....
CCG6	B	S-P	4	6	12¼ x 14½	530	514	..	....	A	....	....	....	....	....	.....
CCG7	B	S-P	4	7	12¼ x 14½	620	514	..	....	A	....	....	....	....	....	.....
CCG8	B	S-P	4	8	12¼ x 14½	710	514	..	....	A	....	....	....	....	....	.....
DDG5	B	S	4	5	15 x 17½	560	360	..	....	A	....	....	....	....	....	.....
DDG6	B	S	4	6	15 x 17½	675	360	..	....	A	....	....	....	....	....	.....
DDG7	B	S	4	7	15 x 17½	785	360	..	....	A	....	....	....	....	....	.....
DDG8	B	S	4	8	15 x 17½	900	360	..	....	A	....	....	....	....	....	.....

Armstrong Siddeley Motors Ltd.
Coventry, England

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-11HP	A	M-S-P	4	1	4¼ x 4¼	6–11	1000–1800	C	....	H-E	....	....	28	24	33	510
14-22HP	A	M-S-P	4	2	4¼ x 4¼	14–22	1000–1800	C	....	H-E	....	....	35	24	37	700
20-33HP	A	M-S-P	4	3	4¼ x 4¼	20–33	1000–1800	C	....	H-E	....	....	43	27	39	970

Range of clutches and gears available.

Burmeister & Wain American Corporation
17 Battery Place, New York 4, N.Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
20MT-30	A	S	4	2-6	7.9 x 11.8	35*	600	O	....	A	....	....	....	....	....	.....
20MTB-30	A	S	4	3-6	7.9 x 11.8	50*	600	O	....	A	T	....	....	....	....	.....
25MT-40	A	S	4	2-7	9.8 x 15.7	60*	500	O	....	A	....	....	....	....	....	.....
25MTB-40	A	S	4	3-7	9.8 x 15.7	85*	500	O	....	A	T	....	....	....	....	.....
33MT-48	A	M-S	4	3-7	13.0 x 18.9	100*	400	O	....	A	....	D	....	....	....	.....
28V-50	A	M-S	2	4-9	11.0 x 19.7	122*	360	O	....	A	....	D††	....	....	....	.....
33MTB-48	A	M-S	4	3-7	13.0 x 18.9	140*	400	O	....	A	T	D	....	....	....	.....
28VB-50	A	M-S	2	5-9	11.0 x 19.7	175*	360	O	....	A	T	D††	....	....	....	.....
35V-62	A	M-S	2	4-10	13.8 x 24.4	200*	300	O	....	A	....	D	....	....	....	.....
42V-75	A	M-S	2	4-10	16.5 x 29.5	240*	240	O	....	A	....	D	....	....	....	.....
35VB-62	A	M-S	2	5-10	13.8 x 24.4	270*	300	O	....	A	T	D	....	....	....	.....
42VB-75	A	M-S	2	5-10	16.5 x 29.5	324*	240	O	....	A	T	D	....	....	....	.....
50V-90	A	M-S	2	4-10	19.7 x 35.4	410*	200	O	....	A	....	D	....	....	....	.....
50VT-110	A	M-S	2	4-10	19.7 x 43.3	520*	170	O	....	A	....	D	....	....	....	.....
50VB-90	A	M-S	2	5-10	19.7 x 35.4	554*	200	O	....	A	T	D	....	....	....	.....
50VTB-110	A	M-S	2	5-10	19.7 x 43.3	667*	170	O	....	A	T	D	....	....	....	.....
74T-150	A	M-S	4	6-10	29.1 x 59.0	575*	120	O	....	A	....	D	....	....	....	.....
50VT-110/40	A	M-S	2	4-10	19.7 x 43.3/15.7	585*	170	O	....	A	....	D	....	....	....	.....
62V-115	A	M-S	2	4-10	24.4 x 45.3	600*	150	O	....	A	....	D	....	....	....	.....
62VT-115	A	M-S	2	4-10	24.4 x 45.3	600*	150	O	....	A	....	D	....	....	....	.....
62VT-140	A	M-S	2	4-12	24.4 x 55.1	655	135	O	....	A	....	D	....	....	....	.....
50VBT-110/40	A	M-S	2	5-10	19.7 x 43.3/15.7	790*	170	O	....	A	T	D	....	....	....	.....
62VB-115	A	M-S	2	5-10	24.4 x 45.3	810*	150	O	....	A	T	D	....	....	....	.....
62VTB-115	A	M-S	2	5-10	24.4 x 45.3	810*	150	O	....	A	T	D	....	....	....	.....
74VT-140	A	M-S	2	4-10	29.1 x 55.1	875*	125	O	....	A	....	D	....	....	....	.....
62VTB-140	A	M-S	2	5-12	24.4 x 55.1	900	135	O	....	A	T	D	....	....	....	.....
74VT-160	A	M-S	2	5-12	29.1 x 63.0	920*	115	O	....	A	....	D	....	....	....	.....
74VTB-140	A	M-S	2	5-12	29.1 x 55.1	1190*	125	O	....	A	T	D	....	....	....	.....
75VT-150/50	A	M-S	2	4-10	29.5 x 59.0/19.7	1230*	120	O	....	A	....	D	....	....	....	.....
74VTB-160	A	M-S	2	5-12	29.1 x 63.0	1250*	115	O	....	A	T	D	....	....	....	.....
75VT-170/60	A	M-S	2	4-10	29.5 x 66.9/23.6	1300*	110	O	....	A	....	D	....	....	....	.....
75VTB-150/50	A	M-S	2	4-10	29.5 x 59.0/19.7	1650*	120	O	....	A	T	D	....	....	....	.....
75VTB-170/60	A	M-S	2	4-10	29.5 x 66.9/23.6	1755*	110	O	....	A	T	D	....	....	....	.....
ALPHA-340	A	M	2	2-4	7.9 x 13.4	50*	450	O	....	A	....	††	....	....	....	.....
ALPHA-400	A	M	2	2-6	9.1 x 15.7	70*	375	O	....	A	....	††	....	....	....	.....
ALPHA-490	A	M	2	4-8	11½ x 19¼	120	310	O	....	A	....	††	....	....	....	.....
BUKH-EV80	A	M-S-P	4	1	3.1 x 4.3	6*	1800	R	....	E-H**	....	....	....	....	....	.....
BUKH-EV100	A	M-S-P	4	1-3	3.9 x 5.1	10*	1500	B	....	E-H**	....	††	....	....	....	.....

** Hp per cylinder. ** Also cartridge start. †† Controllable pitch propeller and sailing clutch of own manufacture. On models with dual stroke, shorter stroke is for exhaust piston.*

Gebr. Eicher Traktorenfabrik
Forstern/Munich, Germany

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In-	Weight Lb.
ED1e	A	M-S-P	4	1	4.13 x 5.9	13*	1500	†	....	E	....	....	28	27	38	749
ED1	A	M-S-P	4	1	4.33 x 5.9	16*	1500	†	....	E	....	....	26	27–31	38–43	827
ED1b	A	M-S-P	4	1	4.33 x 5.9	19*	1500	†	....	E	....	....	26	27–31	38–49	827
ED1d	A	M-S-P	4	1	4.52 x 5.9	22*	1650	†	....	E	....	....	26	27–31	38–49	827
ED2e	A	M-S-P	4	2	4.13 x 5.9	26*	1500	†	....	E	....	....	33	27	45	1091
ED2b	A	M-S-P	4	2	4.33 x 5.9	33*	1500	†	....	E	....	....	33	27	55	1102
ED2d	A	M-S-P	4	2	4.52 x 5.9	40*	1500	†	....	E	....	....	33	27	55	1102
ED3d	A	M-S-P	4	3	4.52 x 5.9	60*	1650	†	....	E	....	....	....	....	....	.....

Engine capacity according to German norm. Stationary service, capacity 10% less. † Deckel

Henschel & Sohn GmbH
Kassel, Germany

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
519D2	A	M-S-P	4	2	4.13 x 5.12	23–27	1800	G	....	E	....	....	28	22	35	605
517D4	A	M-S-P	4	4	3.94 x 5.12	67–87	2200–2500	G	....	E	....	....	34	25	38	725
517D4U*	A	P	4	4	3.94 x 5.12	87	2500	G	....	E	....	....	40	48	20	800
512DGP	A	M-S-P	4	6	3.78 x 4.92	79–101	2000–2200	G	....	E	....	....	44	25	42	1000
512DJP	A	M-S-P	4	6	3.78 x 4.92	79–108	2000–2100	G	....	E	....	....	44	27	44	1040
522DP	A	M-S-P	4	6	3.94 x 5.12	101–128	2200–2500	G	....	E	....	....	44	25	42	1040
522DPU*	A	P	4	6	3.94 x 5.12	128	2500	G	....	E	....	....	50	50	18	1100
513DC	A	M-S-P	4	6	4.33 x 5.90	120–148	2000–2200	G	....	E	....	....	53	33	44	1330
514DCU*	A	P	4	6	4.53 x 5.90	163	2200	G	....	E	....	....	52	49	21	1460
520DOR	A	M-S-P	4	6	4.92 x 5.90	138–170	1800–2000	G	....	E	....	....	53	36	47	1580
520DO	A	M-S-P	4	6	4.92 x 5.90	151–185	1800–2000	G	....	E	....	....	53	36	47	1580
521DS	A	M-S-P	4	6	5.31 x 6.1	169–185	1600–1800	G	....	E	....	....	64	31	50	2200
521DU*	A	M-S-P	4	6	5.31 x 6.1	169–185	1600–1800	G	....	E	....	....	67	56	22	2250
521DS-L	A	M-S-P	4	6	5.31 x 6.1	222–257	1600–1800	G	....	E	T	....	72	31	50	2400
521DU-L*	A	M-S-P	4	6	5.31 x 6.1	222–257	1600–1800	G	....	E	T	....	77	56	22	2450
583D8V	A	M-S-P	4	8	5.31 x 6.1	225–250	1600–1800	G	....	E	....	....	51	40	46	2800
583D8V-L	A	M-S-P	4	8	5.31 x 6.1	296–336	1600–1800	G	....	E	T	....	61	40	46	3100
580D12V	A	M-S-P	4	12	5.31 x 6.1	338–370	1600–1800	G	....	A-E	....	....	68	40	46	3200
580D12V-L	A	M-S-P	4	12	5.31 x 6.1	444–514	1600–1800	G	....	A-E	T	....	78	40	46	3700

** Horizontal Engine.*

Klockner-Humboldt-Duetz——Diesel Energy Corporation
82 Beaver Street New York 6, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
MAH711	A	M-S-P	4	1	3½ x 4¼	6	1500	O	....	H	....	....	31	24	21	374
MAH914	A	M-S-P	4	1	4 x 5½	11	1500	O	....	H	....	....	39	30	26	693
MAH916	A	S-P	4	1	4¾ x 6⅝	16	1300	O	....	H-A	....	....	44	35	28	957
MAH320	A	S-P	4	1	6¼ x 7⅞	26	1000	O	....	H-A	....	....	55	39	32	1694
F2M417	A	S-P	4	2	4¾ x 6⅝	32	1800	O	....	H-E	....	....	35	29	44	1441
F1&2L612	A*	M-S-P	4	1 & 2	3½ x 4¾	10 & 20	2000	O	....	H-E	....	....	24&31	21	31	506**
F4L612	A*	M-S-P	4	4	3½ x 4¾	40	2000	†	....	E	....	....	35	25	33	594
A1-6L514	A*	M-S-P	4	1-4 & 6	4⅜ x 5½	16-100	1800	†	....	H-E	....	T-S-O	63	33	40	1606**
A6L614	A*	S-P	4	V-6	4⅜ x 5½	100	1800	†	....	E	....	T-S-O	39	46	25	1672
A8L614	A*	M-S-P	4	V-8	4⅜ x 5½	130	1800	†	....	E	....	T-S-O	43	43	36	1936
A12L614	A*	M-S-P	4	V-12	4⅜ x 5½	200	1800	†	....	E	....	T-S-O	67	48	35	2794
F1L514	A*	P	4	1	4¼ x 5½	16	1800	O	....	H-E	....	....	22	24	41	723
A2-6L514	A*	P	4	2-4 & 6	4⅜ x 5½	32-125	1800-2300	O†	....	H-E	....	....	63	33	40	1430**
F6L614	A*	P	4	V-6	4⅜ x 5½	125	2300	†	....	E	....	....	39	46	25	1595
F8L614	A*	P	4	V-8	4⅜ x 5½	170	2300	†	....	E	....	....	43	43	36	1870
F12L614	A*	P	4	V-12	4¾ x 5½	250	2300	†	....	E	....	....	67	48	44	2750
A4-8M517	A	M-S-P	4	4, 6 & 8	5½ x 6¾	83-170	1500	†	....	A-E	....	....	84	30	48	2992**
BA8M517	A	M-S-P	4	8	5½ x 6¾	250	1500	†	....	E-A	T	....	84	30	51	3300
F6M617	A	P	4	6	5½ x 6¾	175	1800	†	....	E	....	....	63	30	48	2420
T4M320	A	M-S-P	2	V-4	6⅛ x 7⅞	133	800	O	....	A-E	....	....	50	52	51	3110
T8M320	A	M-S-P	2	V-8	6⅛ x 7⅞	267	800	O	....	A-E	....	....	80	48	61	4895
T12M320	A	M-S-P	2	V-12	6⅛ x 7⅞	400	800	O	....	A-E	....	....	98	63	63	7040
T4M420	A	M-S-P	2	V-4	6⅛ x 7⅞	167	1000	O	....	E	....	....	50	52	51	3245
T8M420	A	M-S-P	2	V-8	6⅛ x 7⅞	333	1000	O	....	E	....	....	80	48	61	4730
T12M420	A	M-S-P	2	V-12	6⅛ x 7⅞	500	1000	O	....	E	....	....	98	52	63	6600
T2-4M425	A	M-S-P	2	2-4	5⅞ x 9⅛	47-95	600	O	....	A	....	....	71	37	56	6380**
T4M525	A	M-S-P	2	V-4	6⅞ x 9⅛	216	650	O	....	A	....	D	64	59	77	6710
T8M525	A	M-S-P	2	V-8	6⅞ x 9⅛	433	650	O	....	A	....	D	69	59	77	9790
T12M525	A	M-S-P	2	V-12	6⅞ x 9⅛	650	650	O	....	A	....	D	117	59	77	12540
T4M625	A	M-S-P	2	V-4	6¾ x 9⅛	250	750	O	....	A	....	D	64	59	77	6710
T8M625	A	M-S-P	2	V-8	6¾ x 9⅛	500	750	O	....	A	....	D	69	59	77	9790
T12M625	A	M-S-P	2	V-12	6¾ x 9⅛	750	750	O	....	A	....	D	117	59	77	12540
T1M233	A	M-S-P	2	1	8⅝ x 13	250	500	†	....	A	....	D	93	58	73	10120
T8M233	A	M-S-P	2	V-8	8⅝ x 13	500	500	†	....	A	....	D	110	97	71	14520
A4-8M428	A	M-S-P	4	4, 6 & 8	8⅝ x 11	150-310	600	O	....	A	....	D	116	36	65	10120**
V6M436	A	M-S-P	4	6	9½ x 14¼	300	500	O	....	A	....	D	134	42	77	21230
V6&8M536	A	M-S-P	4	6 & 8	10⅝ x 14¼	375 & 500	500	O	....	A	....	D	164	42	83	27500**
V6&8M545	A	M-S	4	6 & 8	12⅝ x 17¾	500 & 660	375	O	....	A	....	D	161	53	95	41500**
BV6&8M536	A	M-S-P	4	6 & 8	10⅝ x 14¼	560 & 750	500	O	....	A	T	D	140	42	94	27940**
BV6&8M545	A	M-S	4	6 & 8	12⅝ x 17¾	800 & 1060	375	O	....	A	T	D	201	53	129	48230**
V6&8M366	A	M-S	4	6 & 8	16⅛ x 26	915 & 1210	275	O	....	A	..	D	295	72	142	117920**
BV6&8M366	A	M-S	4	6 & 8	16⅛ x 26	1500 & 2000	275	O	....	A	T	D	300	72	173	119460**

** Air cooled. † Denotes Robert Bosch Equipment. ** Where range of engines is shown, weights and dimensions are for largest engine in range. In most cases, width and height are the same for all engines in the range.*

Lister-Blackstone, Inc.
420 Lexington Avenue, New York 17, N. Y.

Lister Engines

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
LD1	A	M-S-P	4	1	3 x 3½	3.5*	1800	C	....	H-E	....	O	22	19	25	245
LD2	A	M-S-P	4	2	3 x 3½	7*	1800	C	....	H-E	....	O	28	21	28	406
3½-1	A	S-P	4	1	3¾ x 5½	3.3*	650	C	....	H	....	....	36	24	40	750
6-1	A	S-P	4	1	4½ x 5½	5.7*	650	C	....	H	....	....	36	24	40	760
12-2	A	S-P	4	2	4½ x 5½	11.4*	650	C	....	H	....	....	51	24	40	1060
21-2	A	M-S	4	2	4½ x 5½	20.5*	1200	C	....	H-E-A	....	O	53	23	46	1583
30-3	A	M-S	4	3	4½ x 5½	30	1200	C	....	H-E-A	....	O	63	23	46	2042
40-4	A	M-S	4	4	4½ x 5½	38.7*	1200	C	....	H-E-A	....	O	72	23	46	2336
61-6	A	M-S	4	6	4½ x 5½	60*	1200	C	....	A-E	....	O	75	38	53	2580
FR1	A	M-S-P	4	1	3¾ x 4½	9*	1800	C	....	H-E	....	O	25	23	36	795
FR2	A	M-S-P	4	2	3¾ x 4½	18*	1800	C	....	H-E	....	O	30	23	36	977
FR3	A	M-S-P	4	3	3¾ x 4½	27*	1800	C	....	H-E	....	O	35	23	36	1100
FR4	A	M-S-P	4	4	3¾ x 4½	36*	1800	C	....	H-E	....	O	44	24	36	1480
FR6	A	M-S-P	4	6	3¾ x 4½	54*	1800	C	....	H-E	....	O	54	24	36	1660
TS3	A	M-S-P	2	3	3¼ x 4†	77*	1800	C	....	E	M	**	42	31	30	1000

** BHP quoted is for 12 hour continuous running with 10% overload for 1 hour. † TS3 is a horizontal opposed-piston engine. Multiply stroke per cylinder by 2 to obtain total piston travel. ** Reverse gear made by Self-Changing Gears Ltd.*

Maschinenbau Kiel Aktiengesellschaft
MAK, Kiel, Germany

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
MZ582	A	M-S	4	10	15⅝ x 22¾	1250	300	*	....	A	....	D	335	56	137	122000
MA582	A	M-S	4	8	15⅝ x 22¾	1000	300	*	....	A	....	D	280	56	137	95000
MS582	A	M-S	4	6	15⅝ x 22¾	750	300	*	....	A	....	D	226	56	137	80000
MZ582A	A	M-S	4	10	15⅝ x 22¾	1920	300	*	....	A	T	D	335	56	137	126000
MN582A	A	M-S	4	9	15⅝ x 22¾	1720	300	*	....	A	T	D	305	56	137	115000
MA582A	A	M-S	4	8	15⅝ x 22¾	1530	300	*	....	A	T	D	280	56	137	102000
MS582A	A	M-S	4	6	15⅝ x 22¾	1150	300	*	....	A	T	D	226	56	137	82000
4Z421	A	M-S	2	4	11⅞ x 16⅞	500-600	370-428	*	....	A	....	D	138	75	105	26500
6Z421	A	M-S	2	6	11⅞ x 16⅞	750-900	370-428	*	....	A	....	D	175	75	105	36000
8Z421	A	M-S	2	8	11⅞ x 16⅞	1000-1200	370-428	*	....	A	....	D	210	75	105	46000
MV423	A	M-S	4	4	11⅞ x 16⅞	240-265	340-375	*	....	A	....	D	120	48	93	21000
MS423	A	M-S	4	6	11⅞ x 16⅞	390-450	370-428	*	....	A	....	*	155	48	93	30000
MA423	A	M-S	4	8	11⅞ x 16⅞	520-600	375-428	*	....	A	....	D	189	48	93	37000
MS423A	A	M-S	4	6	11⅞ x 16⅞	560-690	370-428	*	....	A	T	D	155	48	93	31000
MA423A	A	M-S	4	8	11⅞ x 16⅞	760-920	375-428	*	....	A	T	D	189	48	93	40-**
MD36	A	M-S	4	3	8⅛ x 14⅝	90-120	375-500	*	....	A	....	D	81	44	79	9900
MV36	A	M-S	4	4	8⅛ x 14⅝	120-160	375-500	*	....	A	....	*	98	44	79	11900
MS36	A	M-S	4	6	8⅛ x 14⅝	180-240	375-500	*	....	A	....	D	125	44	79	16400
MS36A	A	M-S	4	6	8⅛ x 14⅝	270-400	375-500	*	....	A	T	D	125	44	80	17200
MS301	A	M-S-P	4	6	9⅛ x 11⅞	370	750	*	....	A	....	*	115	35	75	13900
MA301	A	M-S-P	4	8	9⅛ x 11⅞	500	750	*	....	A	....	*	140	35	75	17200
MS301A	A	M-S-P	4	6	9⅛ x 11⅞	600	750	*	....	A	T	*	118	35	75	14600
MS301C	A	M-S-P	4	6	9⅛ x 11⅞	650	750	*	....	A	T	*	134	35	75	14600
MS301CK	A	M-S-P	4	6	9⅛ x 11⅞	750	750	*	....	A	T	*	137	35	75	14900
MA301A	A	M-S-P	4	8	9⅛ x 11⅞	800	750	*	....	A	T	*	162	35	78	17900
MA301C	A	M-S-P	4	8	9⅛ x 11⅞	850	750	*	....	A	T	*	171	35	79	17900
MA301CK	A	M-S-P	4	8	9⅛ x 11⅞	1000	750	*	....	A	T	*	167	35	79	18100
MV24	A	M-S-P	4	4	7⅛ x 9⅛	80-160	500-1000	*	....	A-E	....	*	68	33	57	6200
MS24	A	M-S-P	4	6	7⅛ x 9⅛	120-240	500-1000	*	....	A-E	....	*	68	33	57	8400

** Make not known.*

Maschinenfabrik-Augsburg-Nuernberg A. G.
American M•A•N Corp., 149 Broadway, New York 6, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D0022m	A†	M-S-P	4	2	3.94 x 4.92	22	1800	G	....	E	....	....	24	29	37	770
D0024m	A†	M-S-P	4	4	3.94 x 4.92	45	1800	G	....	E	....	....	35	32	37	1030
D0026m	A†	M-S-P	4	6	3.94 x 4.92	68	1800	G	....	E	....	....	44	27	43	1130
D1246m	A†	M-S-P	4	6	4.41 x 5.51	90	1800	G	....	E	....	....	47	28	45	1520
D1548m	A†	M-S-P	4	8	4.53 x 5.51	140	1800	G	....	E	....	....	45	47	49	2000
D1548mT	A†	M-S-P	4	8	4.53 x 5.51	165	1800	G	....	E	T	....	45	56	53	2400
WV14/18	D	M-S-P	4	4 & 6	5.51 x 7.08	95 & 180	1200&1500	G	....	A-E	....	....	45&62	25	46	....
WV14/18mA	A	M-S-P	4	6	5.51 x 7.08	275	1500	G	....	A-E	T	....	73	25	50	4300
WV17.5/22A	D	M-S-P	4	3-8	6.89 x 8.66	100-320	900-1200	G	....	A-E	....	....	44-98	32	53-57	....
WV17.5/22AmA	A	M-S-P	4	6 & 8	6.89 x 8.66	310-460	1000-1200	G	....	A	T	....	93&115	32	55&63	....
WV22/30A	A	M-S-P	4	6 & 8	8.66 x 11.81	330-520	750-900	G	....	A	....	....	98&122	30	74	....
WV22/30AmA	A	M-S-P	4	6 & 8	8.66 x 11.81	610-950	750-900	G	....	A	T	....	98&122	30	75&78	....
VV22/30	A	M-S-P	4	12 & 16	8.66 x 11.81	660-1040	750-900	G	....	A	....	....	....	....	....	....
VV22/30mA	A	M-S-P	4	12 & 16	8.66 x 11.81	1220-1900	750-900	G	....	A	T	....	....	....	....	....
WV30/38A	A	M-S	4	6,8,10&12	12.99 x 14.96	620-1440	600-700	G	....	A	....	D	....	....	....	....
WV30/38AmA	A	M-S	4	6,8,10&12	12.99 x 14.96	985-2300	600-700	G	....	A	T	D	....	....	....	....
LV18/21	A	M-S-P	4	12	7.1 x 8.27	700-750	1500-1600	G	....	A-E	....	....	81	54	70	8000
LV18/21mT	A	M-S-P	4	12	7.1 x 8.27	1250-1380	1500-1600	G	....	A-E	T	....	86	54	81	8600
GV23.5/33	D	M-S	4	3-8	9.25 x 12.99	145-440	514-600	O	....	A	....	D	....	....	....	....
GV23.5/33mA	D	M-S	4	6-8	9.25 x 12.99	515-685	600	O	....	A	T	D	....	....	....	....
GV30/45	D	M-S	4	3-9	11.81 x 17.71	160-790	250-428	O	....	A	....	D	....	....	....	....
GV30/45LMA	D	M-S	4	6-9	11.81 x 17.71	475-1170	250-428	O	....	A	T	D	....	....	....	....
GV40/60	D	M-S	4	5-10	15.75 x 23.62	655-1430	273-300	O	....	A	....	D	....	....	....	....
GV40/60mA	D	M-S	4	5-10	15.75 x 23.62	1050-2280	273-300	O	....	A	T	D	....	....	....	....
GV52/74A	D	M-S	4	6-10	20.47 x 29.13	1500-2500	250	O	....	A	....	D	....	....	....	....
GV52/74AmA	D	M-S	4	6-10	20.47 x 29.13	2400-4000	250	O	....	A	T	D	....	....	....	....
KV45/66mHA	A††	M-S	4	6-8	17.71 x 25.98	2800-3730	250	O	....	A	T*	D	....	....	....	....
GZ52/70	A	M-S	2	5-10	20.47 x 27.56	1920-4250	225-250	O	....	A	....	D	....	....	....	....
GZ52/90	A	M-S	2	5-10	20.47 x 35.43	1650-4100	150-187	O	....	A	....	D	....	....	....	....
KZ57/80	A††	M-S	2	5-10	22.44 x 31.50	2350-5300	200-225	O	....	A	....	D	....	....	....	....
KZ57/80mA	A††	M-S	2	6-10	22.44 x 31.50	3990-6650	225	O	....	A	T	D	....	....	....	....
KZ60/105	A††	M-S	2	5-10	23.62 x 41.34	2840-5670	167	O	....	A	....	D	....	....	....	....
KZ60/105mA	A††	M-S	2	6-10	23.62 x 41.34	4240-7070	167	O	....	A	T	D	....	....	....	....
KZ70/120	A††	M-S	2	4-10	27.56 x 47.24	2460-6950	115-130	O	....	A	....	D	....	....	....	....
KZ70/120mA	A††	M-S	2	6-10	27.56 x 47.24	5250-8700	130	O	....	A	T	D	....	....	....	....
KZ78/140	A††	M-S	2	6-10	30.70 x 55.10	5400-9000	115	O	....	A	....	D	....	....	....	....
KZ78/140mA	A††	M-S	2	6-10	30.70 x 55.10	6750-11250	115	O	....	A	T	D	....	....	....	....
DZ53/80	A**	M-S	2	4-10	20.87 x 31.50	3240-8100	214	O	....	A	....	D	....	....	....	....
DZ60/110	A**	M-S	2	5-10	23.62 x 43.31	4280-8550	130	O	....	A	....	D	....	....	....	....
DZ72/120	A**	M-S	2	5-10	28.34 x 47.24	6220-12450	120	O	....	A	....	D	....	....	....	....

** Highly Turbocharged. ** Double acting. † "Whisper" Engine, multi-fuel use (With MAN Patented Silent Combustion Principle). †† Cross head.*

D. Napier & Son, Ltd.
909 Dupont Circle Bldg., Washington 6, D.C.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. H.P.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
9-26C	A	S-P	2*	9	5½ x 7¼†	860	1500	..	....	A	....	....	91	71	84	6410
9-5B&5C	A	M	2*	9	5½ x 7¼†	825	1500	..	....	A	....	O	99	71	84	8500
9-26C	A	M	2*	9	5½ x 7¼†	860	1500	..	....	A	....	....	91	71	84	6410
18-25C	A	S-P	2*	18	5½ x 7¼†	1725	1500	..	....	A	....	....	104	71	83	9340
18-25H&25J	A	M	2*	18	5½ x 7¼†	1650	1500	..	....	A	....	O	130	72	84	11300
18-11B	A	M	2*	18	5½ x 7¼†	1875	1700	..	....	A	....	O	126	72	84	11150

*All models are of the "Deltic" 2-cycle design. * Opposed piston. † Multiply stroke by 2 because of opposed piston design.*

Petter Engine Division of Brush ABOE Inc.
60-07 39th Avenue, Woodside 77, New York

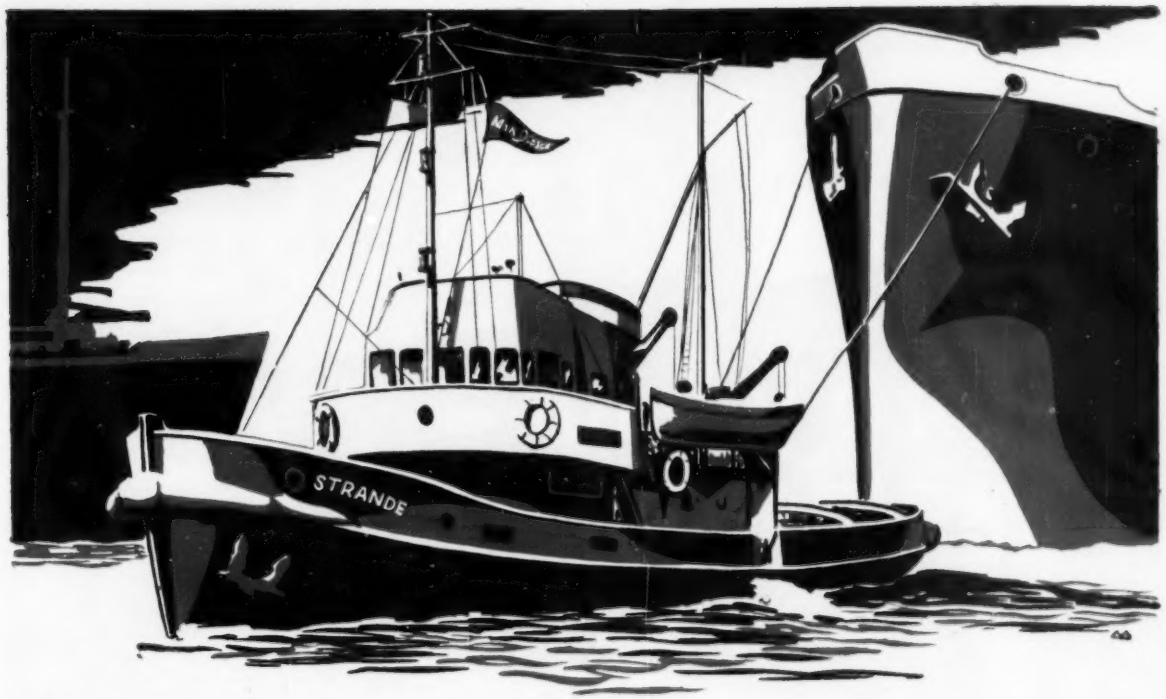
Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
PAZ1*	A	S-P	4	1	3 x 3	3	1800	**	....	H	....	....	18	18	26	260
AVA1*	A	M-S-P	4	1	3.15 x 4.33	6	1800	**	....	E-H	....	††	30	21	30	390
AVA2*	A	M-S-P	4	2	3.15 x 4.33	12	1800	**	....	E-H	....	††	37	21	32	558
AV1	A	M-S-P	4	1	3.15 x 4.33	6	1800	**	....	E-H	....	††	30	21	29	406
AV2	A	M-S-P	4	2	3.15 x 4.33	10-12	1500-1800	**	....	E-H	....	††	37	21	32	598
B2	A	M-S-P	4	2	4.33 x 4.33	20	1500	**	....	E-H	....	†	46	23	41	907
B3	A	M-S-P	4	3	4.33 x 4.33	30-36	1500-1800	**	....	E-H	....	†	56	23	41	1211
B4	A	M-S-P	4	4	4.33 x 4.33	40-48	1500-1800	**	....	E-H	....	†	62	23	41	1491

** Air cooled. ** Bryce. † Parsons. †† Morris. Dimensions are for "S" & "P" units.*

Sulzer Bros. Ltd., New York
50 Church Street, New York 7, N.Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
BA22	C	S	4	3-8	8.67 x 12.6	200-600	500-600	O	....	A	T	....	....	....	....	.....
BA29	C	S	4	6-8	11.4 x 14.4	700-950	500	O	....	A	T	....	....	....	....	.....
BA36	A	S	4	8	14.4 x 23.6	2000	425	O	....	A	T	....	....	....	....	.....
T24	A	M	2	4&6	9.46 x 15.75	300&450	400	O	....	A	....	O-D	....	....	....	.....
T29	A	M	2	4-9	11.4 x 19.75	400-900	300	O	....	A	....	D	....	....	....	.....
T36	A	M-S	2	4-10*	14.4 x 23.6	600-1600	250-300	O	....	A	....	D	....	....	....	.....
T48	C	M-S	2	4-12†	18.9 x 27.5	1400-4200	225-250	O	....	A	....	D	....	....	....	.....
T56	A	M	2	5-8	22.1 x 39.4	2000-3200	155	O	....	A	....	D	....	....	....	.....
SAD60	A	M	2	4-12	23.6 x 41	.. ..	150	O	....	A	T	D	....	....	....	.....
SAD72	A	M	2	4-12	28.3 x 49.3	.. ..	125	O	....	A	T	D	....	....	....	.....
SF72	C	S	2	6-12	28.3 x 35.4	4500-9000	187	O	....	A	....	....	....	....	....	.....
LDA19	A	P	4	6	7.5 x	420	1100	O	....	E	T	....	....	....	....	.....
LDA22	A	P	4	6	8.67 x	570	950	O	....	E	T	....	....	....	....	.....
LDA25	A	P	4	6 & 8	9.85 x	735 & 960	850	O	....	E	T	....	....	....	....	.....
LDA28	A	P	4	6, 8 & 12	11.0 x	920-2350	750 & 935	O	....	E	T	....	....	....	....	.....
RSD58	A	M	2	4-12	22.8 x 29.9	2080-6240	240	O	....	A	T	D	....	....	....	.....
RSAD76	A	M	2	4-12	29.9 x 61	5200-15600	119	O	....	A	T	D	....	....	....	.....

** 4 to 8 for stationary. † 5 to 12 for marine.*



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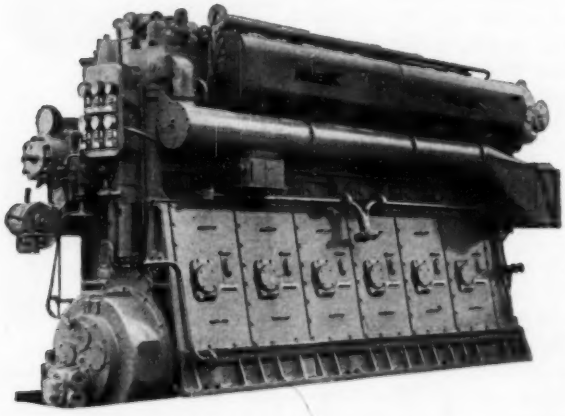
So MaK engines of the M582 Series are used more and more for propulsion of tugs.

Here is a typical case. On one of the most heavily-used navigable waterways, the North Sea—Baltic Sea canal, the towing and rescue boat STRANDE was recently placed in service. Carrying the highest Finnish classification as an icebreaker, it keeps the canal obstruction-free in winter, thus handling ships' traffic the year round without interruption.



In many other harbors of the world, tugboats, rescue boats and icebreakers are powered with the sturdy M582 Series engines. These, being reinforced in all main parts, have proven their reliability in heavy-duty service and in vital operations.

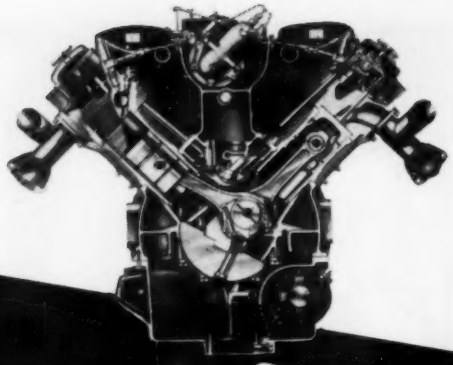
Here is some data on the M582 Series engines of special interest to you.

Horsepower Range: 750 to 1920 HP
Speed Range: Up to 300 RPM
Bore: 15.16 IN; Stroke: 22.83 IN
Nominal Piston Speed: 1142 FPM
Four-Stroke Cycle—Direct Fuel Injection—Individual Injection Pumps—Sturdy Tie-Rod Construction—Column-Type Structure

Customer service and licensed shop facilities are available in many big sea and inland harbors.

MaK

MASCHINENBAU KIEL AKTIENGESELLSCHAFT



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DEUTZ

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DEUTZ "AIRCOOLED" DIESELS range from 5 to 310 BHP in 1, 2, 3, 4, 6, 8, and 12 cylinder models. Quick starting, they run at top efficiency in any weather, at temperatures of −40° to+140° F. Higher operating temperatures assure more efficient fuel use, and greatly reduce corrosion due to condensation of sulphurous acids.

DEUTZ WATERCOOLED DIESELS range from 3 to 2000 BHP in 2, 4, 6, 8, and 12 cylinder models, naturally aspirated and turbo-charged. They are unequalled for ruggedness; simple, compact design; efficiency of operation under the toughest conditions.

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DIESEL ENERGY CORPORATION

82 Beaver Street, New York 5, N. Y.

DIESEL ENERGY CORPORATION Dept. PO-1
82 Beaver Street, New York 5, N. Y.

I would like more information on:
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City _____ Zone _____ State _____

PARTIAL SPECIFICATIONS TABLE

Model	Cont. BHP/Cont. RPM
F 1 L612	10/2000
F 2 L612	20/2000
F 3 L612	30/2000
F 4 L612	40/2000
F 6 L612	60/2000
A/F 2 L514	30/1600
A/F 3 L514	45/1600
A 4 L514	60/1800
A 6 L514/614	90/1800
A 8 L614	120/1800
A 12 L614	180/1800

Also a full range of automotive engines with 4, 6, 8 and 12 cylinders operating at 2300 RPM.
Watercooled Marine and Industrial Diesels, 2 and 4 cycle, from 3-2000 BHP in slow and medium speeds.

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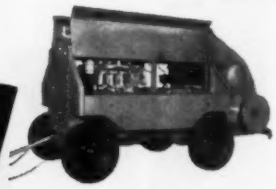
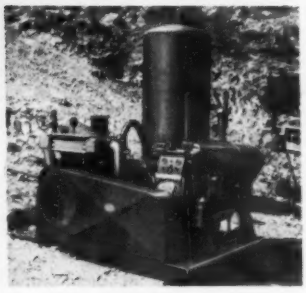
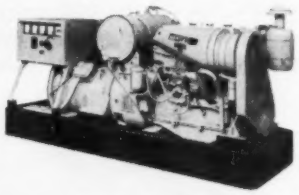


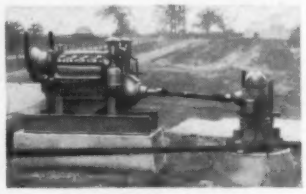
UTILITIES



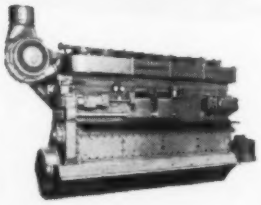
MINING



DIESEL ELECTRIC

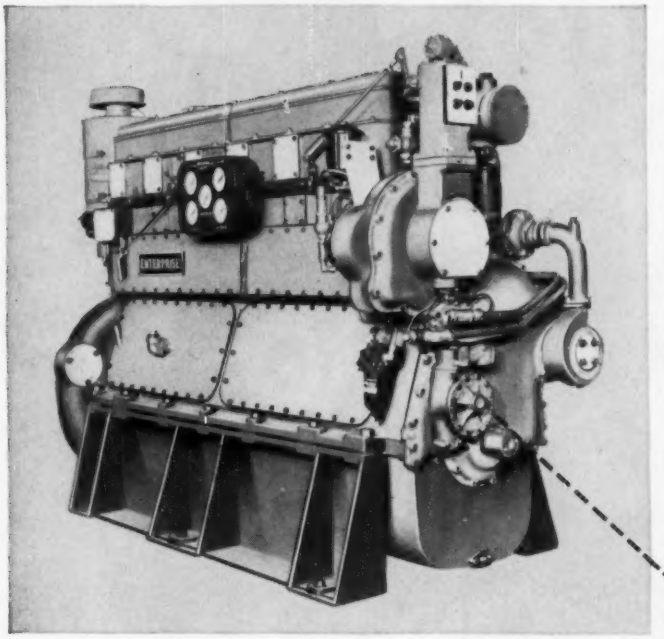


IRRIGATION

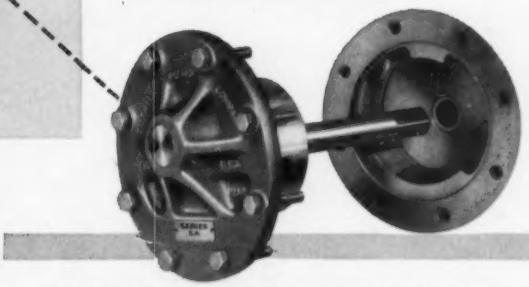


MARINE

ANOTHER PUMP PROBLEM...SOLVED BY TUTHILL



AUTOMATIC
PRESSURE LUBRICATION
FOR
ENTERPRISE DIESEL...
WITH
TUTHILL
PUMPS



The intercooled Enterprise DSM-8 Diesel shown here was built for use on the government railroad in Saudi Arabia under ambient temperature conditions up to 130°F. Other Enterprise diesels are used for oil field petroleum pumping, marine applications and for a variety of other services.

In applications like these, dependable operation and minimum maintenance are *musts*. Therefore, Enterprise engineers took special pains to build into their units fool-proof positive pressure lubrication systems. For example, the complete lubrication system to all moving parts of the DSM-8 above includes pressure lubricated valve rocker-arm assemblies and rifle drilled crank shaft and connecting rods for pressure lubrication of connecting rod and piston pin bearings.

Naturally, Enterprise's engineers chose the TUTHILL MODEL 5CSA pump as the heart of their lubrication system. For Tuthill has a long and enviable record in meeting requirements of the diesel industry. And the Model 5CSA provides the performance characteristics and dependability required in this demanding application.

Model 5CSA, like all Tuthill Series SA stripped pumps, incorporates all the advantages of Tuthill's positive displacement internal-gear design. In the SA Series the mounting brackets and housing normally furnished with Tuthill pumps have been removed. Only the essential pumping elements are provided—the rotor, and the idler and cover assembly. This allows diesel manufacturers to incorporate the dependability of Tuthill pumps directly into the design of their machinery...with the greatest possible economy of space and material...with significant improvements in appearance...at an economical price.

In addition to the SA Models, Tuthill furnishes also Model "S" pumps complete with housing but without mounting brackets. Investigate the advantages of Tuthill stripped pumps in your equipment. Call your Tuthill representative today.

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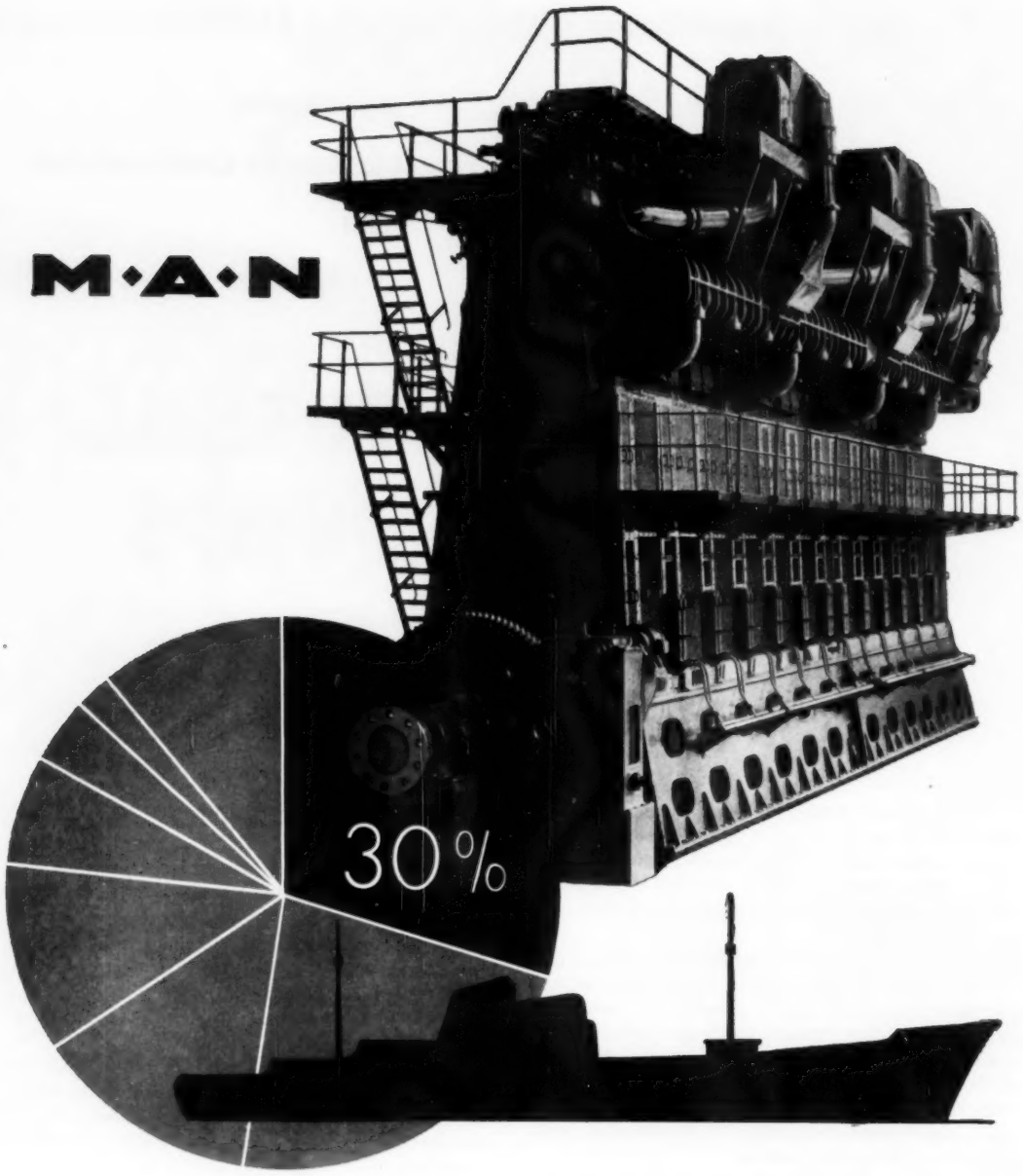
M·A·N



Of 477 motor vessels built in 1956 with carrying capacities over 2000 tons d.w.c. M.A.N. and their licensees equipped 141 ships with engines, i.e. 30 per cent. 86 of these 141 ships received original M.A.N. engines so that every fifth motor vessel over 2000 tons d.w.c. built in 1956 operates with original engines of the Augsburg Works. Total output of large marine diesel engines built by the Augsburg Works of M.A.N. in 1956 amounts to 360,110 BHP.

(According to "The Motor Ship", January 1957)

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The finest filters weren't good enough. So . . . Winslow made them even better!

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A properly installed Winslow Full-Flow Filter helps keep your lube oil cool in two ways: **First,** if installed externally or directly in the air stream from your fan, the filter provides air cooling for the oil. **Second,** the capacity of the filter, added to the capacity of your crankcase, means that with Winslow full-flow filtration you have a greater oil reservoir and therefore do a better job of ridding the engine of excessive oil heat.

GREATER GPM RANGE—Select the filter designed for your engine. With oil flowing freely through a filter of adequate capacity, your engine cannot suffer from lack of proper lubrication, nor will it overheat as readily.

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Instead of a lengthy job usually required when a shaft has to be removed, the GOLTEN PROCESS* will complete the work in a plant in a fraction of the time . . . or aboard ship while a vessel is spending its usual layover time in port.

So compact is the equipment employed that it can be carried in two suitcases by two men and transported speedily wherever needed . . . anywhere in the world. Nothing else is needed but compressed air; electricity is used only for light.

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Crankpins to be concentric with the original centers and truly round and parallel within the most rigid specifications. While scored journals or crankpins are being reground, the bearings may be shipped by air, if desired, to our nearest plant to be rebabbitted centrifugally on specialized GOLTEN apparatus.

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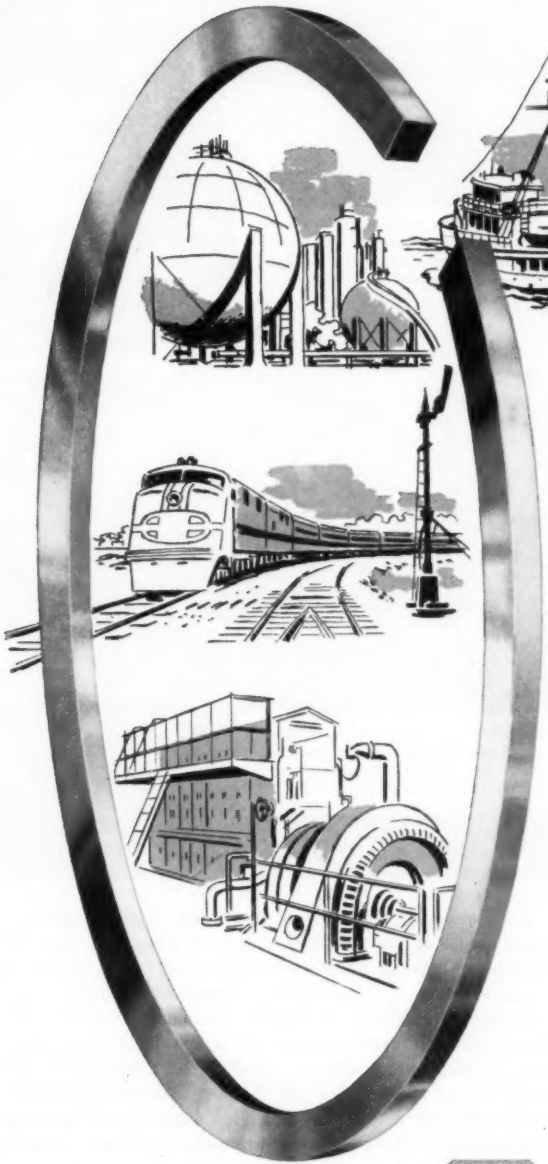

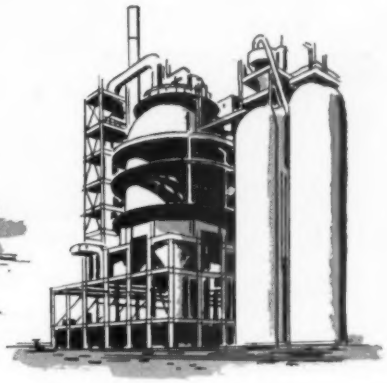

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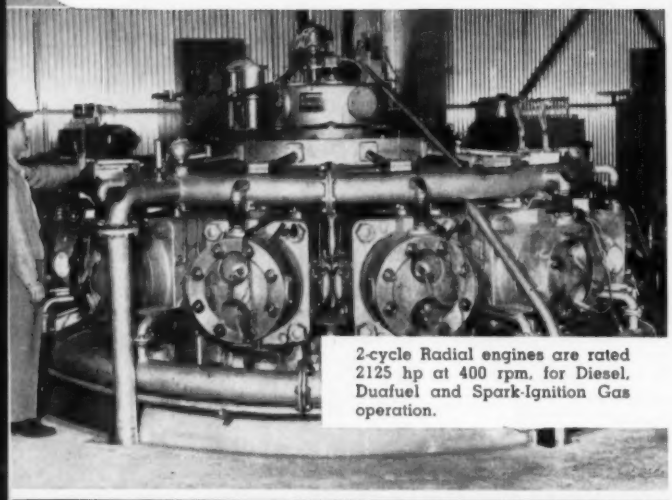
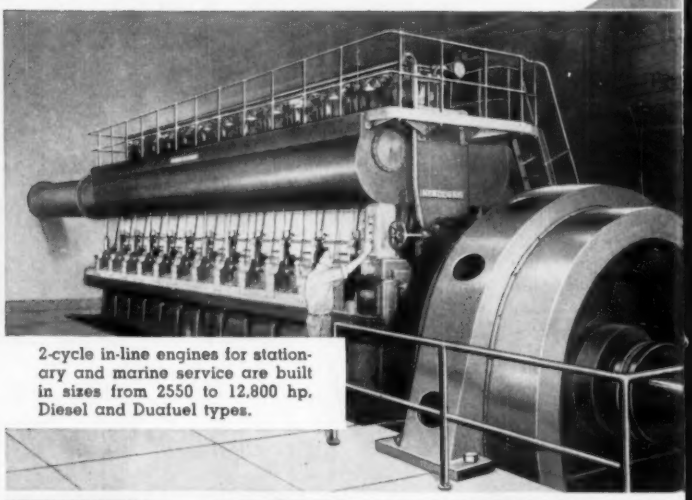
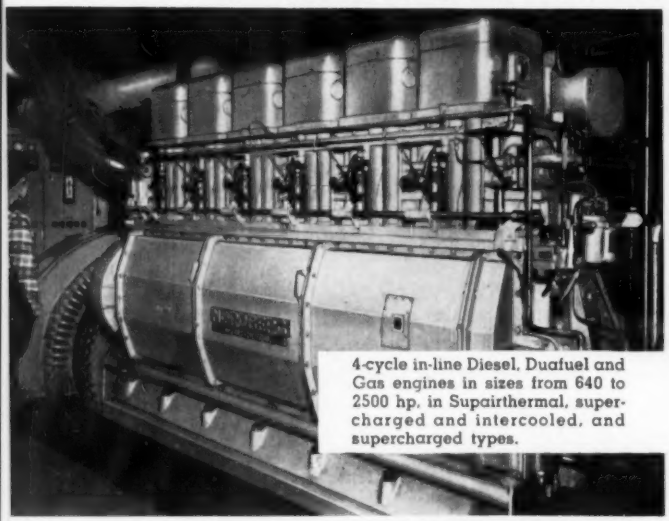


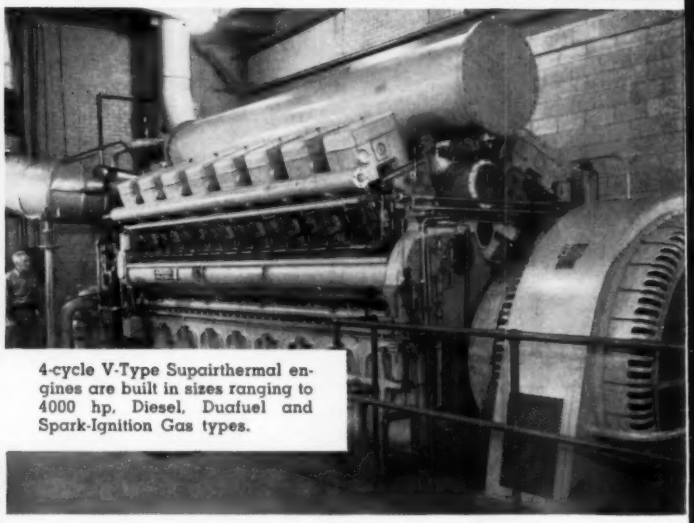
2-cycle Radial engines are rated 2125 hp at 400 rpm, for Diesel, Duafuel and Spark-Ignition Gas operation.



2-cycle in-line engines for stationary and marine service are built in sizes from 2550 to 12,800 hp, Diesel and Duafuel types.

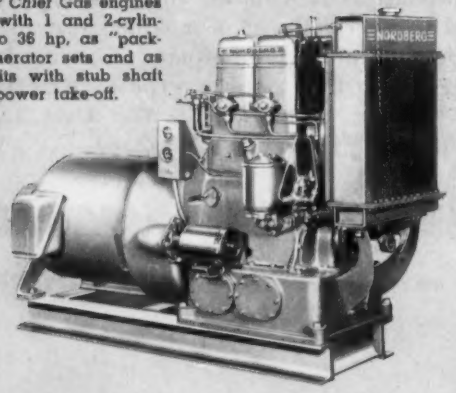


4-cycle in-line Diesel, Duafuel and Gas engines in sizes from 640 to 2500 hp, in Supairthermal, supercharged and intercooled, and supercharged types.



4-cycle V-Type Supairthermal engines are built in sizes ranging to 4000 hp, Diesel, Duafuel and Spark-Ignition Gas types.

Power Chief® Diesels are offered with 1, 2 and 3-cylinders, rated 10 to 45 hp or 6 to 30 kw. *Power Chief* Gas engines are built with 1 and 2-cylinders, up to 36 hp, as "packaged" generator sets and as power units with stub shaft or clutch power take-off.



● Pioneer in the Diesel and Gas engine industry, Nordberg has contributed many of the most notable advancements in the development of more efficient prime movers . . . all in the interest of improved fuel economy, simplicity of design, less maintenance and better overall performance. As a result of this experience, Nordberg today . . . with a full range of engine sizes, from 10 to over 12,000 hp, including Diesel, Duafuel® and Spark-Ignition Gas types, is in the best position to help solve your stationary and marine power problems.

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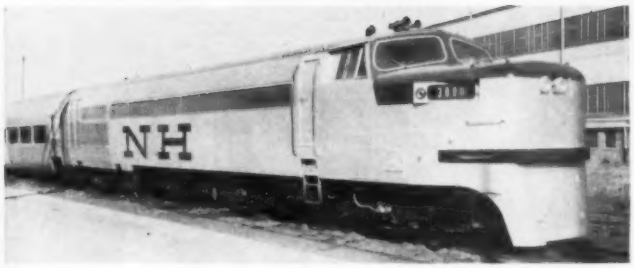
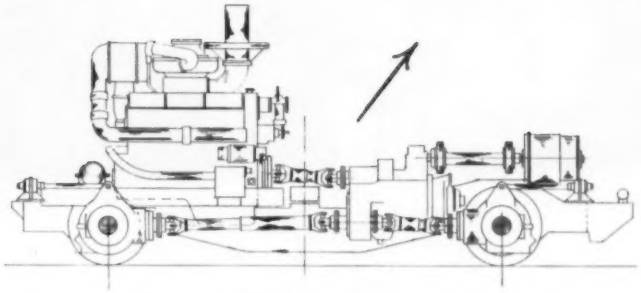
P557

Diesel-Electric and Straight Electric



New Haven's "Dan'l Webster" combines diesel-electric economy with straight electric capabilities for tunnel and terminal service.



Arrow indicates where propulsion power truck with its diesel engine and driving motors is located in forward end of the NH's "Dan'l Webster".

DUAL power operation—diesel-electric and straight electric—solves knotty problems in certain areas. A pair of such locomotives were built in 1956 for the New Haven Railroad. These units will handle their new passenger train "The Dan'l Webster" between Boston and New York City.

This is the lightweight, low center of gravity, high-speed Train "X" developed by the Pullman-Standard Car Manufacturing Company. It is similar to the New York Central's "Xplorer" placed in service in June 1956. Except for differences necessary to meet New Haven requirements these locomotive units are similar to the single Mec-Hydro unit which hauls the NYC Xplorer between Cleveland and Cincinnati, Ohio. This is an entirely new type of diesel locomotive powered by Baldwin-Maybach engines and hydraulic transmission. (See DIESEL POWER January and August 1956).

The units for the New Haven were designed to operate in multiple, one at each end of the train, but controlled from the leading cab. They are equipped to operate on d-c third-rail power over NYC tracks in and out of New York's Grand Central Terminal. Here the diesels must be shut down.

Third Rail Operation

Two 150-hp electric motors, receiving d-c third-rail power are used for propulsion in third-rail territory. They are mounted on the power truck of each unit. These motors transmit power through hi-drive gears installed in the hydraulic transmission. They drive through the torque converter in a manner similar to the diesel engine which is connected on the opposite end of the transmission. Motor speed is controlled by the same throttle handle that controls the diesel engine.

A 200-hp, 1200-rpm, d-c motor on each unit, also using power from the third-rail, drives an a-c generator to furnish head-end power for the train auxiliaries. Out of third-rail territory, this auxiliary generator is driven by a 465-hp, Baldwin-Maybach, 6-cyl, in-line diesel engine.

Shifting Power Source

Remote and multiple-unit controls permit shifting between third-rail and diesel power on both units from the leading cab while the train is in motion. Main and auxiliary diesel engines are disconnected when shifting to motor drive. This is done by means of Maybach air-operated overrunning claw clutches installed in the transmission and between the auxiliary engine and a-c generator. The clutches are engaged when shifting from third-rail to diesel engine drive.

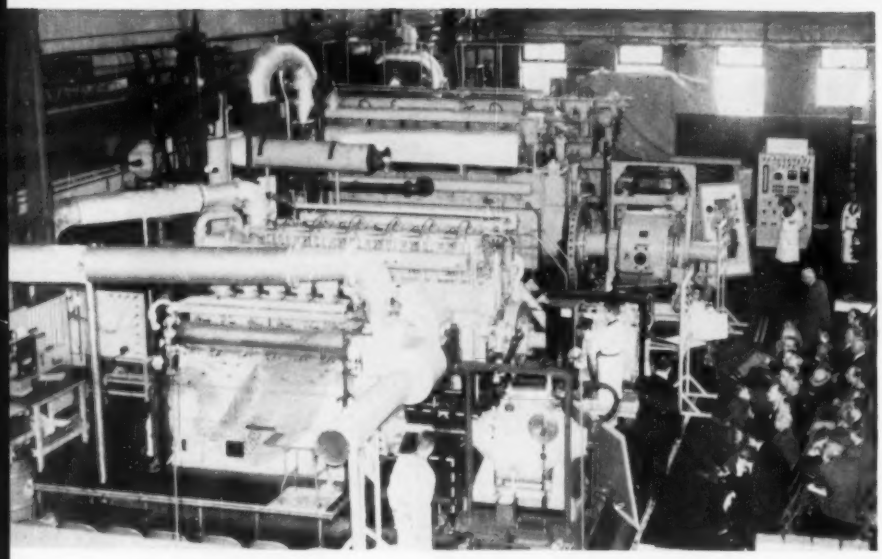
Multiple-unit train wires are carried through the cars and connect automatically when the locomotives are coupled to the cars.

General Data

To maintain the weight of the locomotive equivalent to that of the NYC Xplorer unit, (even with the additional third-rail equipment) aluminum was used extensively for cab, cab sides, roof, floor plates and interior bulkheads. Overall height, length and contour are the same as the Xplorer except that the shape of the cab nose departs from the distinctive styling of the Xplorer.

Continuous tractive effort of each unit is 21,000 lb at 12.6 mph. Maximum safe speed is 120 mph. Fuel consumption is about 1.0 to 1.1 gallons per mile for both propulsion and auxiliary train power.

The Xplorer has run over 140,000 miles. Its availability has been approximately 92%.



Visitors witnessed engine performance at different loads and speeds. SW-14 engine is at rear; SLHC angle compressor can be seen in center; and the SW-9 is shown in foreground.

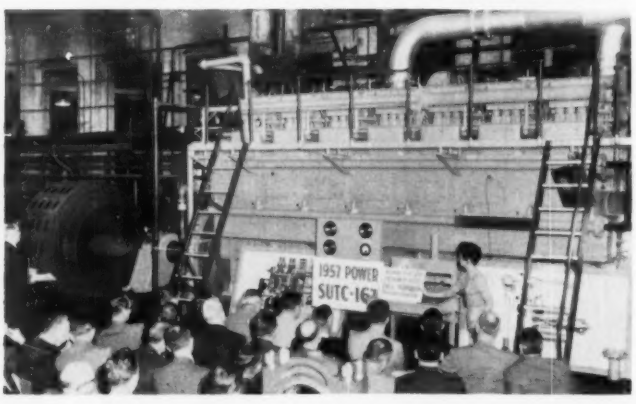
Worthington's "Power Fair"

Under-load demonstrations of the latest versions of four engine models show results of a long-term development program.

WORTHINGTON Corporation's latest engines were recently put through their paces at a 3-day "Power Fair". Some 200 representatives of the gas pipeline and processing industries of this country, Canada and Mexico witnessed the demonstrations. Capabilities of the latest models, embodied in four basic designs, were shown in under-load tests. Visitors also heard about and had a chance to see details of design and construction of these engines.

Models demonstrated included the SUTC, SLHC, SW-14 and the SW-9. Main emphasis was centered on the first two models. When running these angle engine-compressors, special attention was given to reproducing the type of operation encountered in compressor service.

Loud speaker system and cards kept visitors informed of performance data as SUTC angle compressor met simulated field conditions.



Tests were run at varying speeds down to half-speed and below, all with constant torque. Both engines were also operated at varying speeds and partial load to show stability of operation when the compressor ends were unloaded. The SUTC engine, a 2-cycle unit with fully self sustained turbocharging, was stopped and started to show its ability to start without hesitation.

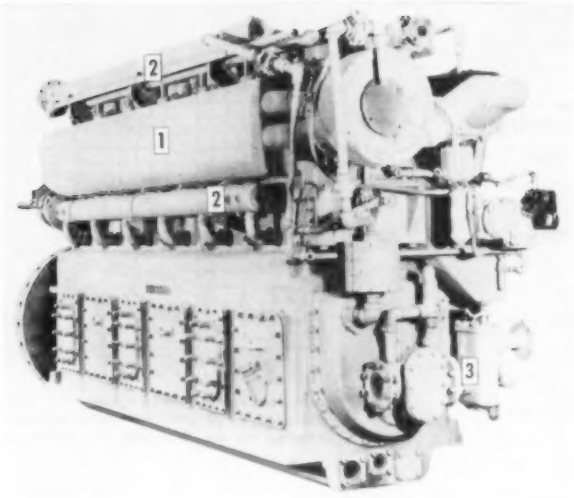
Both the SUTC and SLHC units were run on the Vapor-Phase cooling system. This showed the reliability of the water jacket design to accept high-temperature cooling with water in the neighborhood of 230° to 250°F.

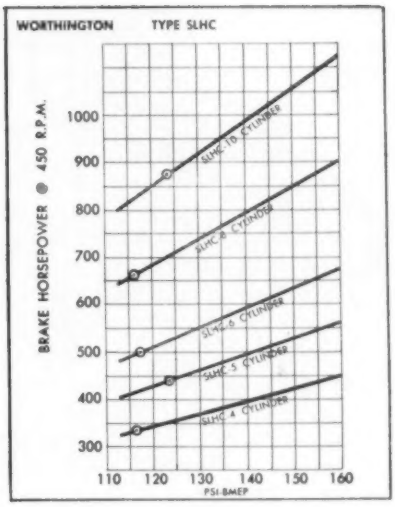
Demonstrations of the SW-9 and SW-14 power engines were aimed at showing their ability to carry both full and overloads at varying speeds. These engines were designed primarily for electrical power generation, powering pumps, compressors, etc.

Of these four basic engine models, the SLHC angle engine compressor unit is the newest. However, all are new in the sense that they incorporate the results of an intensive engineering program of refinement. Current ratings, fuel economy and performance tell the story.

Take the SUTC Engine

George Steven, manager of engineering, went into a little of the background of the SUTC development. This went back to before the first such turbocharged unit was

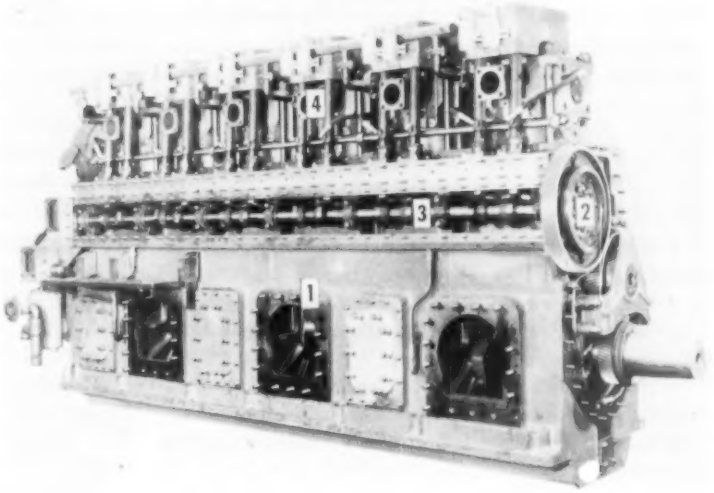




Exhaust side of engine shows (1) dry, insulated exhaust manifold of individually cast sections connected by sliding ring-type expansion joints; (2) inlet and outlet jacket water cooling manifolds; (3) lube oil pump and strainer.

SLHC engine ratings are given at upper right. Circled dots show current ratings of various cylinder combinations. With air after-cooling, higher ratings can be offered on same engines.

Camshaft side of engine shows (1) rugged base and frame; (2) helical cut, steel gear train with sturdy mounting bracket; (3) heavy-duty camshaft; (4) deep, rigid cylinder heads.



installed at the East Bernard Station of the Tennessee Gas Transmission Company on May 17, 1954.

Through-scavenged construction with cam-operated exhaust valves was thought to provide all the necessary flexibility of exhaust and inlet timing for their turbocharging development work. It was expected that auxiliary means, perhaps use compressed air, would be necessary for starting the turbine and thus producing sufficient inlet air.

However, it turned out that application of normal starting air was enough to accelerate the turbo rotor. Sufficient air for combustion was delivered by the blower. So self-sustained turbocharging of this 2-cycle gas engine became a reality.

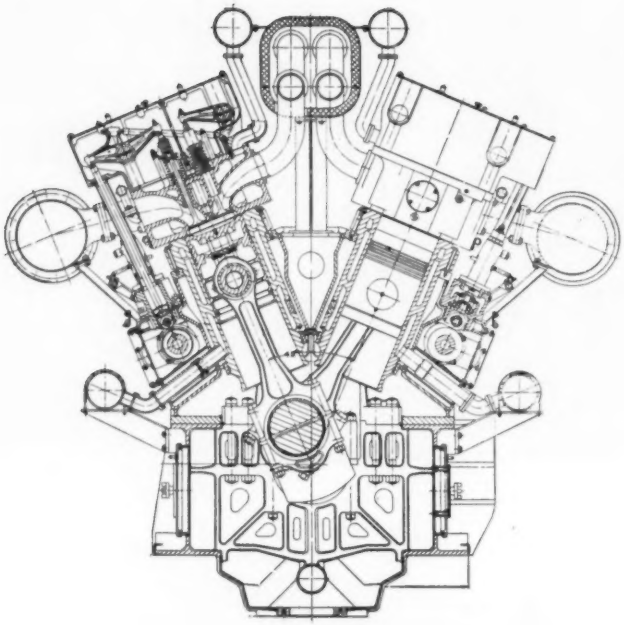
Another interesting discovery was that to expand gases in the cylinder to a pressure lower than air box pressure, it was necessary to advance the exhaust valve opening to 95 deg ATC. Later timing definitely allowed hot gas to blow into the air box, in fact, flame was visible. The engine was timed to 90 deg ATC at which optimum performance was obtained.

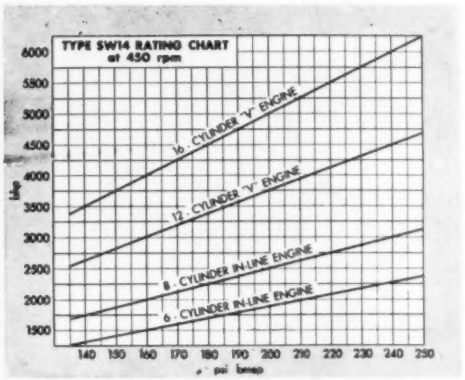
Engine breathing also received attention. There has been constant improvement in this respect. Reduction in temperature of intake air and hence increase of its density was one phase. Another was air chamber redesign to eliminate early pulsation troubles. A third was streamlining of the port passages to reduce resistance to air flow. This simple change alone gave 30% reduction in flow resistance.

Other important changes are structural and in the choice of new and better materials. Mr. Steven summarized all of the more significant changes in his remarks. These included:

1. Larger scavenge chamber volume and increased metal sections to reduce drumming.

2. Large aftercoolers located adjacent to the cylinder inlet ports for maximum cooling effect.





Horsepower ratings are on a continuous basis, allow an overload of 10% for 2 hours per 24 hours operation, and are based on 165 psi to 168 psi bmep.

Section through Worthington Type SW-14 vee-engine shows massive and rugged construction.

3. Tinned pistons with improved piston ring arrangement for optimum lube oil consumption.

4. Use of aluminum main and crankpin bearings.

5. Heavy-duty chain drive, 1.7 times stronger than the first one that has operated for over 2½ years.

6. Revised cylinder heads of nodular iron with much greater resistance to failure due to thermal cycles.

7. Larger diameter camshaft with vibration damper at free end.

8. Outboard bearing to permit use of maximum flywheel for smoothest operation.

9. New liner design to reduce air flow resistance.

10. Counterweighted crankshaft for better balancing of inertia forces.

During the under-load demonstration, the engine showed its ability to start easily and perform smoothly under a broad range of operating conditions. Bore and stroke are 16-in. by 16-in. and the rating per cylinder at 320 rpm is 250 hp. This load is carried without detonation with entering air at conservative and easily obtainable valves. In fact, Mr. Steven reported that an 8-cyl, 2000-hp unit carried 2660 hp before reaching borderline detonation.

Models are built in from three to 10 cylinders. The engine shown was a 7-cyl unit. This gave a 4-3 cylinder split to the two turbochargers. This unequal division presented no problem since slight modification of one nozzle ring and blower rotor gave characteristics providing the same proportionate quantity of air per power cylinder.

Noise level was quite low through the operating range. And very important, the improvements have brought fuel consumption down to about 7000 Btu per hp hr.

Now the SLHC Model

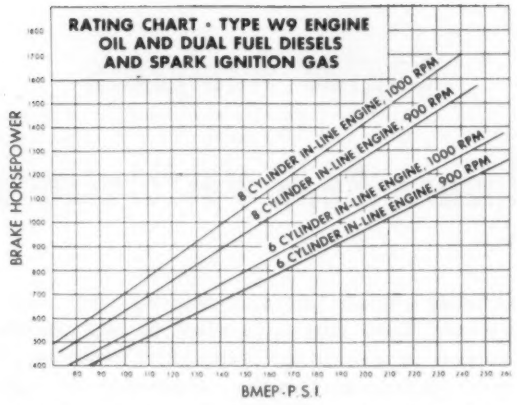
The turbocharged 4-cycle SLHC angle compressor is one of the most compact and powerful units of its kind in the medium power range. It is also the newest addition to Worthington's line of heavy duty engines. Therefore, Mr. H. C. Barten, Manager of the Gas Transmission Section, Engine Sales Division, in presenting a brief talk on this unit, leaned toward basic design and construction features.

Although a recent design, several are currently in operation. The first 6-cyl engine compressor has been working since late 1956 in Northern Natural Gas Company's gas-gathering station at Muncie, Oklahoma. (see DIESEL POWER, Feb., 1957). This was a skid-mounted self-contained unit. Others of this type and for stationary mounting have been sold for gas-gathering, repressuring and recycling service and hydrocarbon gas platforming compressor service.

SLHC's are built in 4, 5, 6, 8 and 10-cyl in-line versions. Bore is 11½-in. and the stroke, 12-in. Horsepower ratings at 450 rpm and conservative bmep's are shown in the accompanying curve. Current ratings are shown by circles. Higher ratings are possible when aftercooling is used. These engines in all sizes are being produced in a constant stocking program to provide quick shipment.

For all sizes and all services, Worthington has a complete line of compressor cylinders to match the particular need for gas or air compression, from field-gathering to petro-chemical and platforming service. All feature the Worthington feather valves.

Design-wise, the SLHC combines many time-proven fea-


RATING CHART · TYPE W9 ENGINE
OIL AND DUAL FUEL DIESELS
AND SPARK IGNITION GAS
BRAKE HORSEPOWER
BMEP-P.S.I.
8 CYLINDER IN-LINE ENGINE, 1000 RPM
8 CYLINDER IN-LINE ENGINE, 900 RPM
6 CYLINDER IN-LINE ENGINE, 1000 RPM
6 CYLINDER IN-LINE ENGINE, 900 RPM

Current standard bhp ratings are based on about 167 psi bmep.

tures of earlier models with some brand new ideas. Here are some of the more important features.

The engine base is a single casting featuring Worthington's cast-in lube oil header that delivers lube oil to the bottom of each main bearing without any external connections.

A heavy forged-steel crankshaft is bedded in heavily-ribbed main bearing supports cast as an integral part of the base. The base is symmetrical so that compressor cylinders may be fiitted to either or both sides of the engine. This allows as many as six compressor cylinders on a 6-cyl engine.

The engine frame is also a single casting. It extends the full length of the base. Heavily-ribbed sections are located between each power cylinder liner to form an A-frame support for the separate cylinder liners and heads.

Power cylinder liners have integrally cast-in high velocity cooling water jackets. External water connections to and from the liner guarantee against water leakage to the base.

Power cylinder heads also have generous cast-in water passages for high velocity cooling. Exhaust valves seat on Worthington's patented seat inserts.

The cooling system of the entire power assembly was designed for operation on high-temperature cooling circuits. The Vapor Phase system of cooling was used on the 6-cyl, 500-hp SLHC demonstrated.

Separate side-by-side connecting rods are used for the power pistons and the compressor running gear. Rods are identical with interchangeable crank and wrist pin bearings. Power pistons are flood oil cooled and have floating wrist pins. Piston crowns are symmetrical to eliminate uneven expansion stresses.

Pulse-type turbocharging is used. The turbocharger is self-contained, the only dependence on the engine being for cooling water. It has its own lube oil system.

A dry, insulated exhaust manifold carries maximum exhaust energy to the turbine. By eliminating use of a water-cooled manifold the additional benefit of lower heat rejection to the cooling water is gained. This means that a smaller, less-costly radiator can be used.

These, then, are some highlights of the 4-cycle angle gas engine-compressor that was put through its paces. There were two more high-output engines to be viewed.

SW-14 and SW-9 Engines

Al Boehm, manager, Eastern Sales Division, had some things to say about the two high-output engines. He went back some five years to when two parallel development programs were initiated. Field demands for more power and higher speed engines in moderate sizes from 500 to 1000 kw supplied the impetus. The outcome was two engine models, both turbocharged 4-cycle units.

Both the SW-14 and the SW-9 are built as diesels, dual-fuel and spark ignition gas engines. By exercising all options, the one engine can be a "tri-power" unit, a combination of the three types. These engines are not exactly new, the two models above having been discussed in DIESEL POWER, May 1955 and December, 1955 respectively. However, current models embody all the refinements resulting from the intense development program.

Both engines show the influence of research as applied to the angle engine-compressors as already mentioned. This is evident in the attention to better breathing turbocharging, the "jet-swirl" intake passages, 4-valve heads, etc. Use of liners with integral water jackets is another example.

These are high output engines. Mr. Boehm cited that current ratings of the SW-14 for continuous service with the customary 2-hr 10% overload per 24 hr were based on 165-168 bmep. Turbo-expanders and such devices as sodium-cooled valves, and aluminizing of valves and turbocharger blading show promise of pushing back thermal limitation barriers still further.

Ratings on the SW-9 are on the same basis. The particular 6-cyl engine demonstrated was cited as having 1000 hr operation at 200 bmep and 100 hr at 220 bmep. No distress, either structurally or thermally, was noted.

The design of both engines, allowing for the size difference, is generally similar. The principal difference is that the crankshaft in the SW-14 is "bedded" while in the SW-9 it is "hung". In the latter case, this leaves the base as a supporting structure only and simplifies extension for support of driven equipment.

As for vital statistics, the SW-14 has a 14-in. by 18-in. bore and stroke. At its rated 450 rpm the piston speed is 1350 fpm. It is built as 6-cyl and 8-cyl inline units and 12-cyl and 16-cyl vee-type models.

The SW-9 has a 9-in. bore and 11-in. stroke. At its 900 rpm speed, piston speed is 1650 fpm. Ratings at 1000 rpm are also offered for 50 cycle operation. It is built in 6-cyl and 8-cyl in-line models. Horsepower ratings of both engines are illustrated.

These engines were intended primarily for electrical power generation and other power applications such as driving pumps and compressors. Typical in the latter categories would be direct drive of reciprocating compressor equipment or drive through stepup gearing of centrifugal compressors such as Worthington's GUP model.

A single-channel Piezo-Calibrator or an electrostatic-type d-c amplifier connects the pickup to the oscilloscope.

Engine Analyzers Insure Peak Performance

Electronic engine analyzers monitor vital engine functions. Their cost is justified by the resulting reduction in downtime, lower parts replacement, better fuel consumption and maintenance of higher output.

ENGINE analyzers are being used today on everything from passenger car engines to big industrial units. Higher outputs, higher speeds and in some cases, the greater degree of complications are all creating the need. The tight economics of engine operations, is justifying the investment in this type of instrumentation.

Test instruments and analyzers are here to stay. They pay for themselves by providing the basis for accurate diagnosis of what's going on in the engine. They save time and money by pinpointing trouble spots. They permit greater accuracy of adjustment for optimum performance and fuel economy.

Today, electronic-type analyzers, once thought suitable only for the research labs, are moving out into the field. There are several types available, each with its own features and capabilities. The one to be discussed here is the SLM Engine Analyzer built by the Kistler Instrument Corp., North Tonawanda, N. Y.

Kistler builds everything but the high-precision crystal and electrostatic pickups. These are Swiss-built by the Swiss Locomotive and Machine Works (SLM).

What It Does

The equipment provides a means of showing a continuous trace of pressures, pressure rates and vibrations on an oscilloscope screen. The analyzer components are simple and rugged enough for shop and field applications.

Cylinder, manifold, fuel injection, and detonation pressures, combustion pressures rates, and engine vibrations can be alternately shown and precisely measured on the oscilloscope screen. The trace shows how pressure continuously varies with time or with piston position. Crankshaft position marks are superimposed on the pressure-time diagrams to indicate top dead center or other positions.

This engine analyzer has been used extensively in leading engine development laboratories for testing, adjusting, and evaluating diesel and gas engines. It is used to adjust timing, peak cylinder pressures, load distribution and injection line pressures. Combustion rates, detonation, compression ratio, valve operation, and vibration levels can be readily checked.

Pressure and vibration patterns for normal operation are generally measured and photographed and used as samples. Any slight deviation from these normal performance patterns due to improper adjustment or faulty operation can be easily detected.

Components

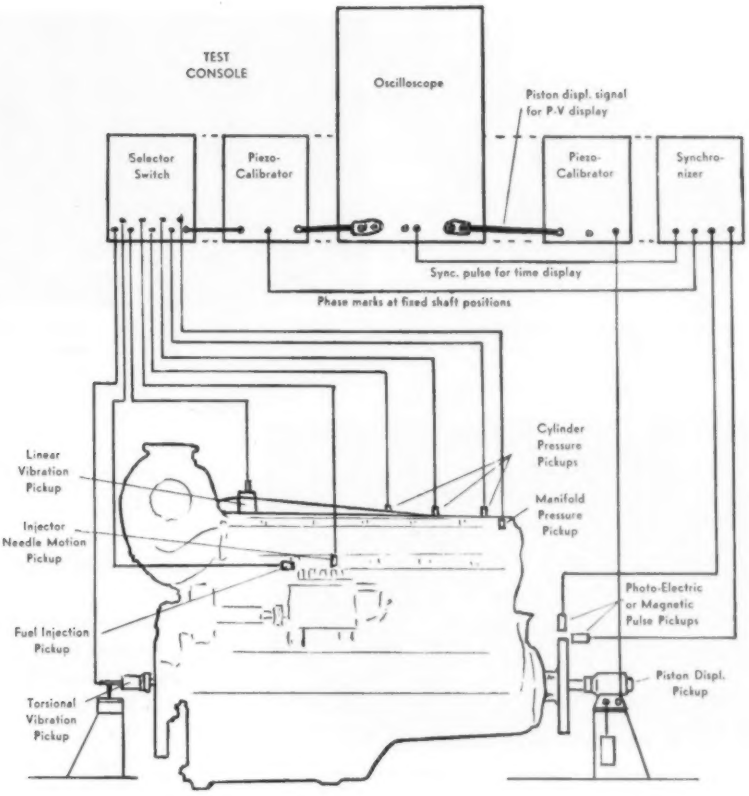
The basic diesel engine analyzer consists of a small quartz crystal pickup, a one-tube amplifier-calibrator unit, a standard oscilloscope, a selector switch and a synchronizing unit. This equipment is set up in a semi-portable console arrangement. Special adaptors and accessories are also available to facilitate special measurements.

The selector switch permits choice of the signal from any of a number of pressure or vibration pickups. The synchronizing unit can be either a pulse-type for pressure-time displays, or the SLM piston displacement indicator for direct indicator card-type (pressure-volume) diagrams.

Peak cylinder pressure or pressures at any point on the diagram are simply measured by pushing the calibration button and adjusting the calibration knob until the base line is displaced level with the peak pressure. Then the peak pressure can be read directly off the dial. A typical peak measurement diagram is shown.

Instead of manually pushing the calibration button, a snap switch actuated from a cam on the engine flywheel will automatically show a calibration pulse. The height of this can be controlled with the calibration dial. Accuracy of measurement is within 1%.

The same basic pressure pickup is used for all measurements. It measures pressure, rate of change of pressure, force, or vibration. It can be used as a microphone for



Showing how engine can be completely instrumented to check various engine conditions to diagnose troubles.

measuring pressure variations in sound waves as well as for measuring cylinder pressures above 3000 psi during combustion. The pickup is generally mounted flush with the combustion chamber walls and no special air or water cooling of the pickup is required. It will withstand and measure detonation and preignition phenomena.

Instead of changing pickups to measure manifold pressures, the amplifier is simply switched to a more sensitive range. A high-pressure adaptor permits fuel injection measurements to 30,000 psi. An accelerometer attachment is used to convert the pickup into a high-precision vibration indicator. The pickup in conjunction with the Kistler Piezo-Calibrator amplifier is capable of measuring directly pressure or rate of change of pressure.

The traditional indicator card diagram can be shown directly on the oscilloscope screen. However, this requires an accessory pickup, the SLM piston displacement pickup. This pickup attaches directly to the engine shaft. It provides a signal proportional to piston position which is used to control the horizontal motion of the oscilloscope trace or beam.

A typical p-v diagram is shown. For timing purposes, pips from a pulse pickup can be displayed every few degrees and superimposed directly on the pressure diagrams.

Any portion of an overall engine diagram can be magnified as much as a thousand times by simply switching the instrument to a more sensitive range.

Installation and Calibration

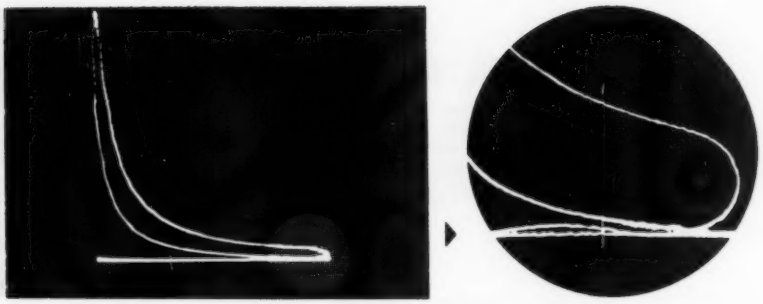
Installation of the pressure pickups can generally be made directly in cylinder openings provided for this or other purposes. When not in use these ports are generally plugged, although permanent installations for continuous monitoring are practical in some cases.

Incidently, a new subminiature engine pressure pickup is being developed for small engines and for engines with small ports. This will be in the form of a pressure probe with ¼-in. diameter.

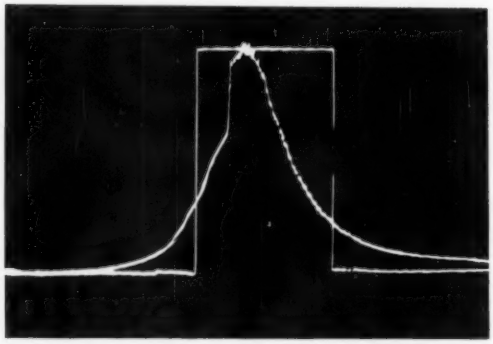
Ideally, the pressure-sensitive end of the pickup should be recessed just below the combustion chamber wall. When mounting adapter or gas duct must be used, it should provide smooth passage to the pickup. Any gas duct produces strong turbulence and high heat transfer. Gas vibrations developing will appear superimposed on the pressure diagram. Cooling of the adapter may be necessary.

Care should be taken, while handling and installing the pickup, to prevent damaging the membrane by contact with any sharp object. This corrugated membrane (visible as a recessed ring at the bottom end) is the only delicate part of the pickup.

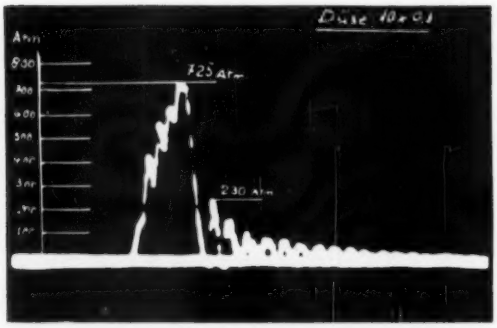
Corrugated membrane visible as a recessed ring at bottom end is the only delicate part of pickup. Don't pierce it.



A diesel pressure-volume diagram as it appears on oscilloscope. Magnification of any portion (as at right) can be obtained.



Diesel p-t diagram, with calibration pulse adjusted and superimposed to measure peak pressure, as seen on oscilloscope.



By proper manipulation of analyzer, selector switch and pickup, various diagrams in desired pressure ranges are obtained. Here's fuel injection pressure variation with time.

Special coaxial cables connect the pickup, calibrator and the oscilloscope. The cable between the pickup and calibrator can be of any desired length without affecting frequency response or calibration. However, maximum sensitivity obtained is inversely proportional to the length of the pickup cable.

The SLM pickup can be calibrated by conventional static methods on a dead weight gauge tester. The calibration factor is independent of temperature, time, mechanical or thermal stresses set up during installations and operation. If high accuracy is not needed, a compressed air manifold may be used. The pickup is then mounted parallel to a precision gauge and the desired pressure is adjusted by means of valves.

And Finally

Modern advanced techniques of measuring and analyzing engine performance are becoming more and more important. Many companies now using these techniques report substantial savings in maintenance, repair and operating costs.

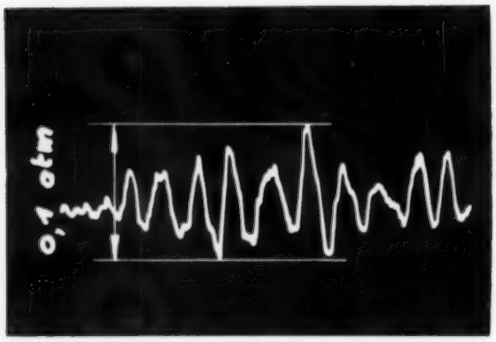


Diagram of intake air pressure in diesel intake manifold. Pickup was placed against intake manifold to take diagram.

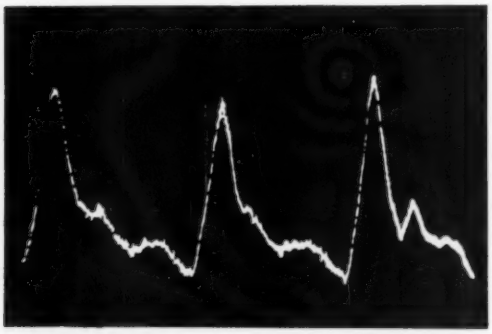
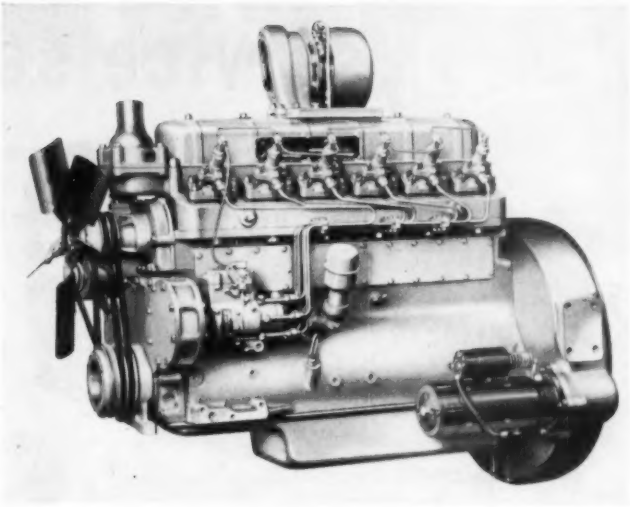


Diagram of exhaust gas pressure in diesel exhaust manifold. Pickup pressed against exhaust manifold made this possible.



Turbocharger which is mounted directly on the manifolds is seen on top center of Waukesha's Model 197-DLCS 6-cyl, heavy-duty diesel rated 131 hp at 2800 rpm.

Waukesha Adds Another Turbocharged Engine

WAUKESHA'S latest turbocharged diesel is the 6-cyl Model 197-DLCS. This compact 4-cycle, heavy-duty engine with a 302-cu in. displacement is rated 131 hp.

Dry, renewable alloy liners are pressed into a special iron cylinder casting. The new engine's oil pan is made of pressed steel. Its housing is an SAE No. 3.

A heavy 7-bearing drop-forged, heat-treated steel crankshaft has hardened journals and turns in precision-type bearings. Heat-treated steel connecting rods are drop-forged. These conrods are rifle-drilled for lubrication.

Heavy-duty aluminum pistons are used. A chrome plated piston ring is used in the top groove. Piston pins are of the full-floating type.

Stellite-faced intake and exhaust valves seat on Stellite-faced inserts. Hardened and ground mushroom-type valve lifters are used. Drop-forged rocker arms have screw-and-lock type adjustments.

A belt-driven pump with by-pass is flange-mounted at the front of the cylinder block and provides positive circulation of the coolant. A thermostat assists in fast warm-up and maintains proper jacket temperatures.

Full pressure lubrication is provided by a gear-driven gear-type pump to the main, conrod, camshaft, and piston pin bearings. Oil under metered pressure is intermittently supplied to the timing gears and rocker arms. Cams and tappets are flood-oiled from the valve chamber spill-back. Cylinders and pistons are lubricated by crankshaft throw-off. A large, waste-packed shunt-connected dual-element oil filter is bolted directly to the crankcase. Pistons are oil cooled through jets at the top of the connecting rods. The lubricating oil cooler is of the built-in type.

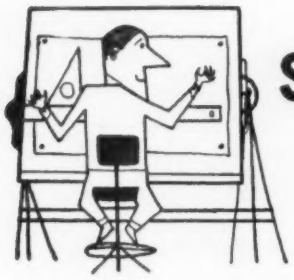
The fuel system includes a RoosaMaster single-plunger flange-mounted injection pump. Drawn-steel injection lines connect it to the single-orifice pintle-type nozzles. A vane-type primary fuel feed pump is used. A hand primer for initial filling of the fuel system is furnished. Both primary and secondary fuel filters safe-guard the fuel injection pump and nozzles.

The units have patented Waukesha combustion chambers and burn standard high-speed diesel fuels with cetane ratings of 45 or over.

The exhaust turbocharger is mounted directly on the manifolds. The turbocharger provides high-level power throughout the load and speed range, providing additional air for combustion with an absolute minimum of parasitic load. This shows up favorably in the fuel consumption curve as well as in the horsepower curve. Maximum horsepower is available without aftercooling.

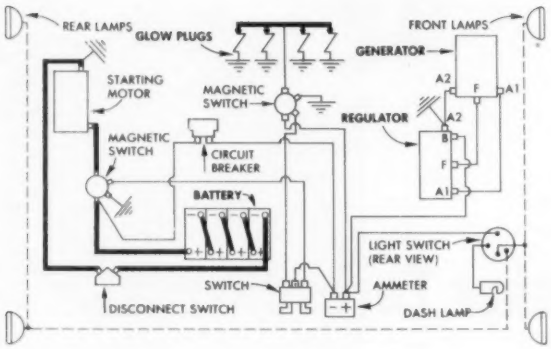
Other advantages gained by the use of the exhaust turbocharger are a relatively light and compact installation. flexibility in mounting, and the elimination of mufflers on most applications. This is possible due to the smoothing out of exhaust impulses by the turbocharger turbine.

Contributing to this new engine's anticipated reliability and long-lived, trouble-free operation are the time-tested features developed in over 50 years of research and experience in building heavy-duty industrial-type internal combustion engines.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you



Maintenance on Cat 24-V Electric Starting System

Maintenance is, of course, important at any temperature, but particularly important at lower temperatures, to reduce cranking effort. Even a well maintained battery loses its cranking ability quite rapidly as temperatures drop. At the same time, the resistance to cranking due to oil friction in the engine or hydraulic unit increases very rapidly in cold weather.

When starting difficulties are encountered with the 24-v direct electric starting system, first check the oil in the diesel crankcase and the hydraulic unit, if so equipped. Oil must be sufficiently fluid to permit easy starting. If starting cannot be accomplished with oils of correct viscosity, locate the items needing repair or adjustment.

Battery maintenance is extremely important. Accumulations of dirt and spilled electrolyte can cause a battery to "run down" at a very rapid rate. The battery should be removed at least once a month and washed with a solution of baking soda and water. It should then be rinsed with clear water, reinstalled and the battery posts coated evenly with a petroleum jelly.

Keep a close check on the amount of water necessary to keep the battery full. Avoid over-filling. Spillage lowers the specific gravity, causes corrosion and can be the cause of severe current leakage. If water is needed more than once a week, the battery is being overcharged.

(*Continued on Page* 110)

Lube Oil For Cummins Engines

Lubricating oil used in Cummins engines should meet U. S. Military Specifications Mil-L-2104A. The responsibility for meeting these specifications, the quality of the product, and its performance in service must necessarily rest with the oil supplier. Cummins Engine Company, Inc. does not recommend any specific brand of lubricating oil.

As a general reference, the Internal Combustion Engine Institute (Chicago) has published (in their Form 300) several hundred oil brand names which the oil suppliers represent as meeting the minimum perform-

(*Continued on Page* 111)

Fuel Filter Replacement Elements for GM "71" and "110" Engines

Since the introduction of paper fuel filter elements and its announcement in September 1955, some questions have developed as to the correct 4-in. and 8-in. fuel filter elements that should be used for servicing Series 71 and 110 engine units.

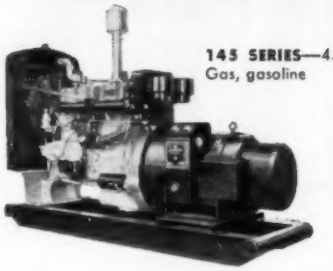
The former 4-in. type filter assembly, Part No. 5179109, uses a flat type cover gasket that is non-reusable. The new 4-in. type filter assembly, Part No. 5573949, uses a reusable synthetic type cover gasket which does not need replacing with each element change. These gaskets are not interchangeable.

When servicing the former assembly, the correct element to use is Part No. 5573263 (TP 511) which includes a filter element and the flat type gasket. When servicing the new assembly, the correct element to use is Part No. 5573261 (TP 509) which includes the filter element and a rectangular synthetic type cover gasket. Filter element, Part No. 5573263 (TP 511) can be used in the former type filter assembly and in the new type filter assembly. Filter element, Part No. 5573261 (TP 509), can be used only in the new type assembly. When using Part No. 5573263 (TP 511) in the new type assembly, gasket, Part No. 5574161, must be used in place of the flat gasket.

The same situation occurs with the 8-in elements. The former 8-in filter assembly, Part No. 5179839, uses a cover gasket the same as the former 4-in type filter assembly. The new 8-in type filter, Part No. 5573950, uses the reusable gasket similar to the new 4-in type filter assembly.

(*Continued on Page* 110)

WAUKESHA



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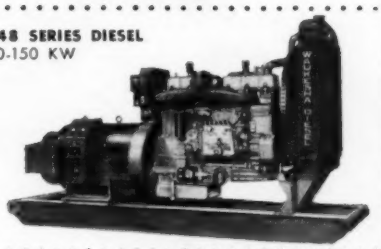

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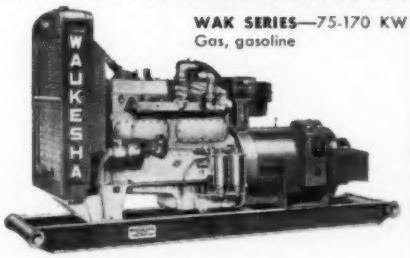

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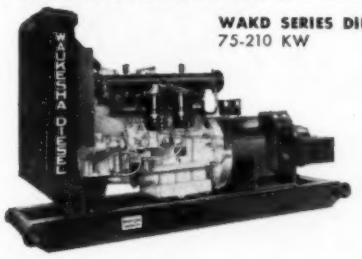
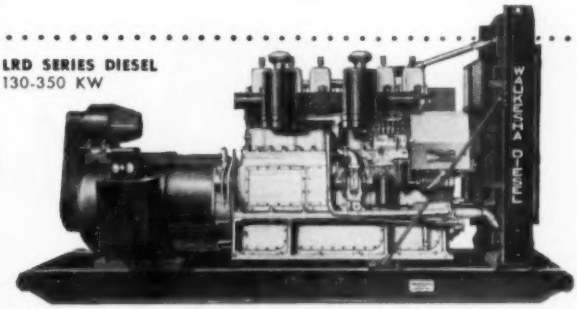


WAKD SERIES DIESEL
75-210 KW



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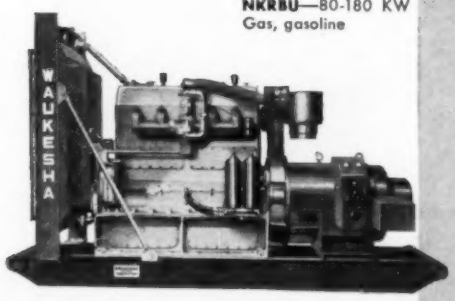

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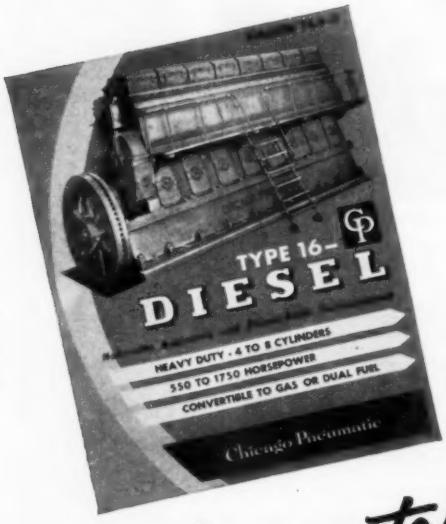

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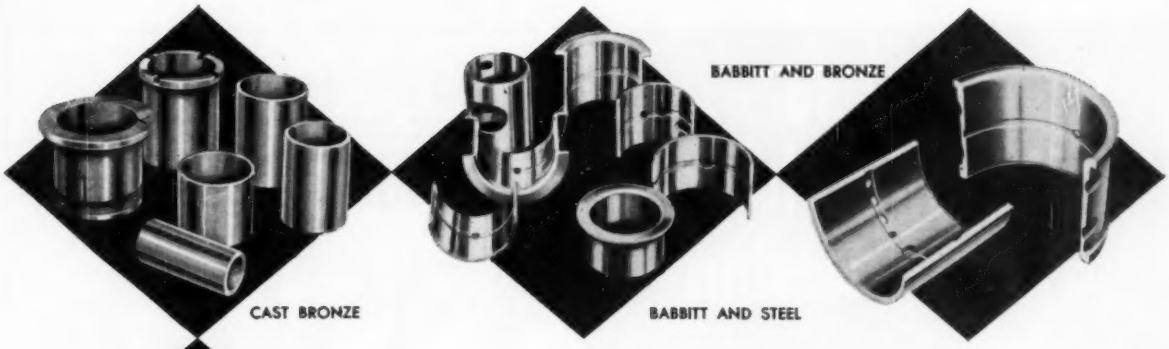
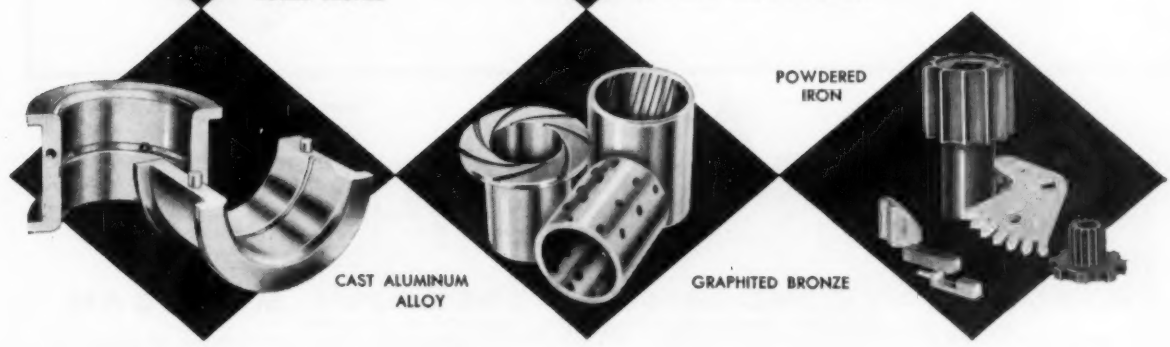


The correct sleeve bearing for your application

You can count on getting the correct sleeve bearing for each application, when you specify Johnson Bronze. Competent engineers and metallurgists, backed by more than 50 years exclusive bearing experience, are available to help you solve your bearing problems. They will recommend the most economical and efficient bearing for each application. All types of sleeve bearings, either standard stock sizes or made to specifications, are available without delay. To get the exact bearing you need at the most economical price, call, write, or wire Johnson Bronze Company, 470 South Mill Street, New Castle, Pennsylvania.

JOHNSON Bearings



How to Simplify Fluid System Design

Get complete engineering and installation information *FREE!* Combination of new, illustrated Aeroquip 64-page Catalog *plus* 16-page Guide for Routing and Installation of Aeroquip Flexible Hose Lines will be sent to you. Just fill in coupon, detach and mail to us.

Aeroquip Corporation, Jackson, Michigan

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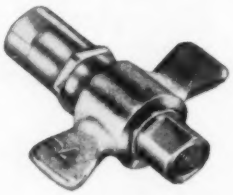
Specify These Aeroquip Flexible Hose Lines and Self-Sealing Couplings

FUEL, OIL, WATER, HYDRAULIC LINES — Single Wire Braid 2651 Hose for medium pressure hydraulic, water, hot oil, crude and fuel oil, anti-freeze, gasoline, diesel fuel and air lines. In sizes from ¼" to 2½"; pressures up to 3000 psi.; temperatures from —40° F. to + 250° F.

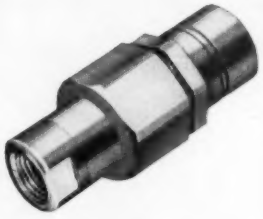
LOW PRESSURE FUEL LINES — 2601 Diesel Fuel Hose and Reusable Fittings for fuel systems up to 125 psi. In 1", 1¼", 1½" and 2" sizes; temperature range —40° F. to +300° F.

AIR COMPRESSOR DISCHARGE LINES—2800 Air Compressor Discharge Hose with Reusable Fittings is designed to withstand temperatures up to 500° F. without becoming brittle or cracked and to minimize carbon pickup, a major cause of line failure. In sizes up to 1¼"; for pressures up to 125 psi.

HIGH TEMPERATURE LINES — 2802 Teflon Hose and Reusable ***"super gem"*** Fittings for fluid systems subject to high temperature and corrosive fluids. Hose and fittings can be assembled with ordinary hand tools. In sizes from ¼" to 1"; for pressures up to 1500 psi.; temperature range —100° F. to +500° F.



SELF-SEALING COUPLINGS—Type 5100 (wing union nut) and Type 5110 (hex union nut) allow quick connection and disconnection of fuel, oil, hydraulic and air lines, replaces two shut-off valves. There is no loss of fluid or inclusion of air into the system on connection and disconnection of fully pressurized lines. In O.D. tube sizes from ⅛" to 1½"; for pressures up to 2000 psi.; temperature range —40° F. to +250° F.



"super gem" is an Aeroquip trademark.

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

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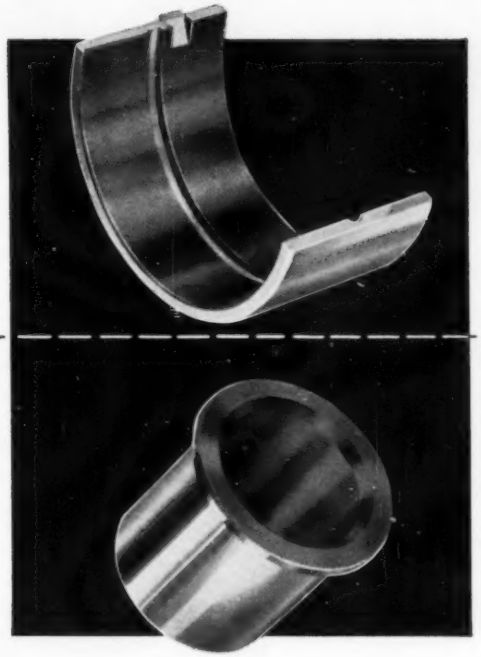
LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

The standard for the leaders in new engine design

Detroit Aluminum and Brass

COPPER LEAD*

engine bearings



Detroit Aluminum & Brass is your dependable source for high duty, aircraft quality, copper lead bearings and sintered copper lead bearings. They are produced with the same high degree of accuracy and precision as the engine bearings of all types we have been supplying to the leaders in the industry since 1925.

*Copper lead bearings are lead-tin overplated to customer's specifications.

Tell our engineers about your requirements. Write...

Detroit Aluminum and Brass Corporation

DETROIT 11, MICHIGAN

***Plants at* Detroit, Michigan and Bellefontaine, Ohio**

news of our industry

Good Horse Sense

Instrument panel cover shown here bars would-be cowboys from riding herd on an International tractor. Newton Creek Development, Brooklyn, N. Y. firm rustled up this safety first idea. The cover slips on and locks in place over the instrument panel. A tension-type catch on the side of the fuel tank holds the cover when the tractor is in use.

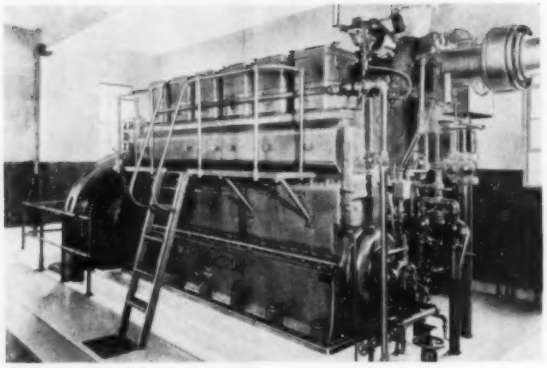
Service Session At Detroit Diesel

Top RR maintenance men from six states devoted three days to special study at GM's Detroit Diesel Engine Division in Jackson, Michigan. The 45 men were briefed on all the ways and means of getting better service and longer life from engines which power their track maintenance equipment. Sponsored by Peninsular Diesel, Inc., distributor for Detroit Diesel, the special session was held at the center for servicing all equipment which keeps 13,000 miles of N. Y. Central in A No. 1 condition.

new products . . . . . Page 92

organizational news . . . . Page 96

new literature . . . . . Page 100



Worthington Units Power Station

Two of these Worthington SCCG-6 gas engine-generators will supply complete power for the Topock gas transmission compressor station of the Southern California Gas Co. Installation of these units is part of the expansion program to bring an extra 278.2 million cu ft of gas per day into southern California.

The Worthington engines incorporate the latest high compression turbocharged design along with Bosch pulse generator ignition system which lowers maintenance materially. Relatively new to the gas transmission industry is the installation of a vapor-phase cooling system in these Worthington units.

Rock En Route to W. Va. Turnpike

Bonus horsepower of the Cummins Turbodiesel engine helps this Model 65 Payhauler International Harvester move rock on 12-mile round trip from quarry to job site. The truck owned by L. S. Coleman Co. is driven by a 262-hp Model NTO-6-BI diesel engine.

Gas Turbine Sessions

Gas Turbine Power Div. of ASME packed a lot of technical data in the six sessions held in Detroit during the 4-day March Conference. Papers were presented by 13 authorities on important phases of gas turbine design, features, performance, problems, maintenance and applications.

Congress on Combustion Engines at Zurich

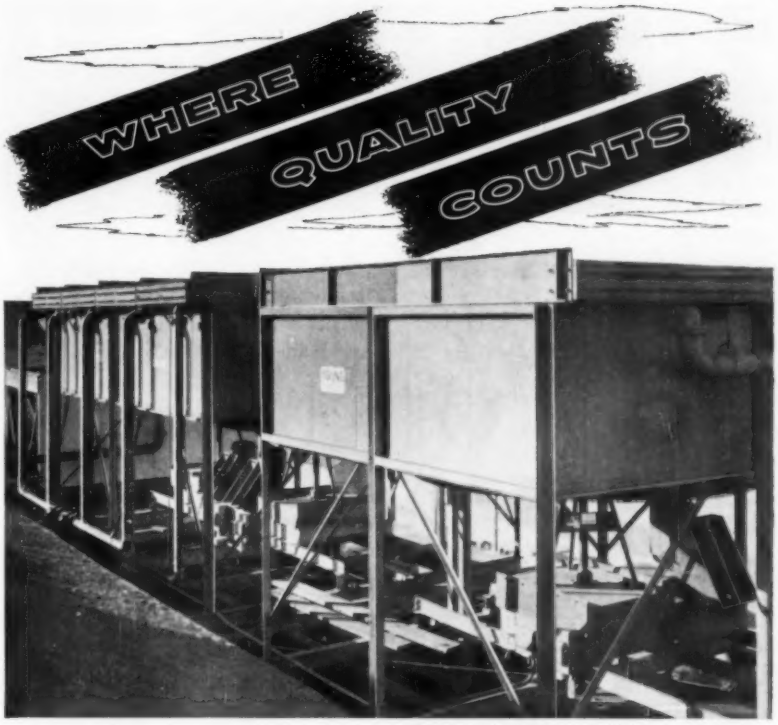
Theme of the 1957 International Congress, slated to open in Zurich on June 17, is "Supercharged Diesel Engines and Combustion Turbines in Marine, Traction and Power Stations". The U. S. contribution to the 3-day technical program will be a paper on "Operational Experience of our Gas Turbine, Free Piston and Diesel Engine Liberty Ship Conversions".

First Rate RR Fact Finders

LMOA deserves repeated praise for the work they're accomplishing in their Pre-Convention activities. They reach many more men in these presentations than they do at the Annual Meeting itself.

Fact-finding committees throughout the country ferret out data to benefit the railroad industry and the men who maintain its diesel locomotives. At various railroad clubs from March through June, open discussions follow reports on each of these subjects: "Economy Fuel—Its Effect on Diesel Locomotive Maintenance"; "Machinery and Equipment for Cleaning, Testing and Overhauling of Diesel Locomotive Components"; "Carbody, Superstructure and Air Compressor Coupling"; "Governor, Engine Air Intake Filters, and Cooling System Controls"; "Economical Methods of Cleaning Steam Generators and Appurtenances"; "Chrome Plated Liners and Crankshafts, and Lube Oil Cooling and Filtering Systems"; "Maintenance and Rebuilding of Traction Motors and Main Generators", and "Determination of Diesel Locomotive Material Items, Economical to Reclaim".

The value and results of these LOMA technical programs should be far-reaching in the locomotive industry.



HC units by Young installed at the Enterprise Engine & Machinery Co., San Francisco, Calif.

HC® UNITS by Young

COOL 10,000 H.P.

DYNAMOMETER

Largest dynamometer installation on the west coast . . . the Enterprise 10,000 H.P. machine depends on HC units by Young for meeting the necessary cooling requirements. The HC unit in the foreground above cools up to 1000 gpm. of test engine jacket water, while the other HC unit cools up to 800 gpm. of dynamometer water.

This is only one of many examples where Young's dependability of performance has been recognized by the diesel power industry. HC units by Young are used the world over for cooling water, oil and gases; and, for condensing steam and vapors. These horizontal core units combine the *efficiency* of vertical air discharge, the *economy* of compact Young design, the *versatility* of multiple unit installations. For *all* heat transfer problems, look to Young for *answers by specialists.*

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Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

Heat Transfer Products for Automotive, Aviation and Industrial Applications.

Heating, Cooling, Air Conditioning Products for Home and Industry.

Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

news of our industry

Expansion at Link-Belt

To keep up with demands of the nation's long-range road building program, Link-Belt Speeder Corp. is again expanding its Cedar Rapids plant. Production of power shovels and cranes can increase up to 40% with their additional facilities for assembly, machine shop and other operations.

MIT Special Summer Session

Mass. Institute of Technology will slant a 2-week summer course specifically to engineers involved in internal combustion engine design. Starting June 17, sessions and demonstrations on engines will include study of engine capacity, theory of similitude in fluid processes, engine efficiency and design, as well as lab techniques and instrumentation. Application blanks for this course can be obtained direct from MIT.

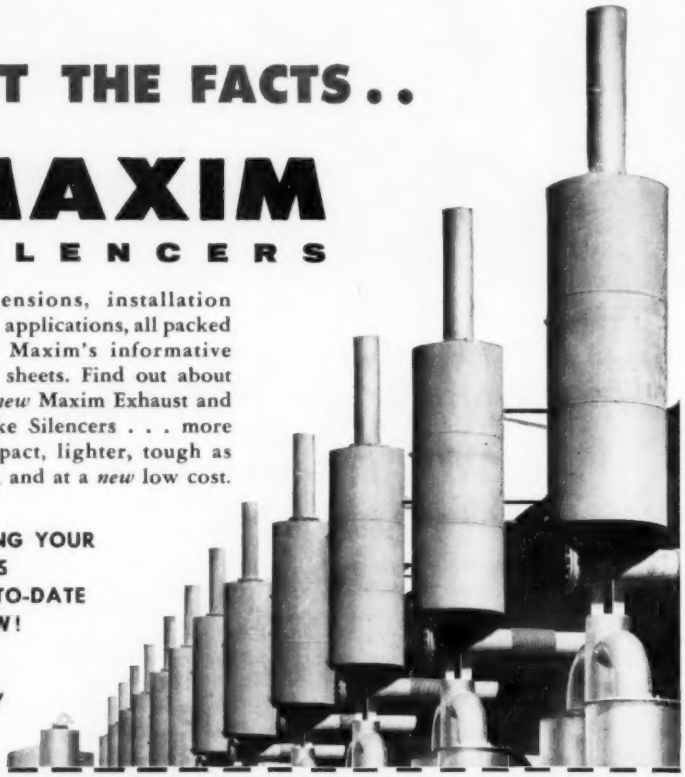
GET THE FACTS..

MAXIM

SILENCERS

Dimensions, installation data, applications, all packed into Maxim's informative data sheets. Find out about the *new* Maxim Exhaust and Intake Silencers . . . more compact, lighter, tough as ever, and at a *new* low cost.

BRING YOUR FILES UP-TO-DATE NOW!



THE MAXIM SILENCER COMPANY

Subsidiary of Emhart Manufacturing Company

93 Homestead Ave., Hartford, Conn.

Gentlemen: Please send bulletins on silencers for: ☐ WASTE HEAT RECOVERY

☐ INTERNAL COMBUSTION AND STEAM ENGINE EXHAUST AND INTAKE ☐ AIR COMPRESSOR INTAKES AND DISCHARGES ☐ VACUUM PUMP DISCHARGES

☐ BLOWER INTAKES AND DISCHARGES ☐ STEAM, AIR OR GAS DISCHARGES ☐ JET AIRPLANE ENGINE EXHAUST AND INTAKE

NAME _____

COMPANY _____

ADDRESS _____

Three Bolts Do Work of Four

By positioning bolts 120 deg apart from a common center, three will give as stable a joint and as great holding power as four symmetrically placed, say Russell, Burdsall & Ward. Stronger bolts, of course, must be used. Fewer holes to drill and fill mean savings in engine assembly. Further savings accrue, they add, in cost of fasteners even when stronger bolts are used.

Cummins Exhibit

Star attraction at the Cummins Engine Exhibit at the '57 Coal Show was the new 375-hp, vee-type 8-cyl diesel engine. Other models exhibited were a 600-hp VT12, a 335-hp NRT-6 Turbodiesel and a 300-hp NHRBIS-600-TC torque converter unit.

Step by Step Through GE School

Meet Jake Lee in the new GE booklet and go with him through five data-packed days at the Industrial Locomotive Training School at Erie, Pa. Made easy with working models, exhibits and slides, he soaks up facts about how to run, how to fix and how to prevent troubles with his 25-tonner.

After his study and try-it-yourself shop tours, Operator Lee goes back to his job with a file of manuals along with his diploma from this thorough, tuition-free school. For details on how to enroll in this training course, use the handy, postage-free card in this issue.

Less Smoke from Diesels

Thanks to intensive research by Dr. Paul H. Schweitzer and his associates at Penn State University, smoke limit from diesel exhaust shows promise of being moved up. In describing his new "fumigation" method as a cross between a carburetor engine and a regular diesel, he points out about 85% of the fuel is injected into the chamber of the diesel in the usual manner, the remainder being introduced into the intake air in a fine mist. Thus when exhaust occurs, in many cases smoke is eliminated without sacrificing power output. With Dr. Schweitzer's new method sub-standard fuels can be utilized in emergencies.

news of our industry

100-mph Engines in England

Britain has quickened the pace of her $3.36 billion railroad modernization plan. Deluxe trains with 100-mph diesel-electric locomotives will go into service on the London, Manchester, Birmingham, Wolverhampton and Bristol runs.

Deliveries in 1957 are expected to include over 160 diesel mainline locomotives, more than 500 diesel switchers and 1700 powered coaches for multiple-unit electric and diesel trains.

By the way, British Information Services adds, production of steam locomotives in Britain has virtually ceased.

Cold-Starting Aid

Power Frequency Heating, Ltd. tackled the engine cold-starting problem from many angles and came up with the dual aid solution of using a combined engine oil heater and a battery charger.

Their method involves direct heating of the engine lube oil, thus reducing its viscosity enough to enable the electrical starting equipment to turn the engine fast enough to start at once. Heating is accomplished by electro-magnetic induction. Using an ordinary ac supply, an alternating magnetic field is set up in a steel tube which is thus heated by hysteresis and eddy currents. The unit is attached to the crankcase. The inlet connection to the sump is below the outlet to take advantage of convection to circulate the oil through the heated tube.

In this way, the oil is quickly and uniformly heated from cold, or kept warm overnight if the unit is plugged into the power supply when the engine is shut down. In fact, the entire engine installation, including pistons, fuel lines and injectors, is kept warm by heat radiated from the oil surface or conducted upwards.

At the same time a low-voltage current is supplied from the same unit; this flows through a rectifier and trickle-charges the battery, thus meeting the second requirement for cold-starting assistance.

THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE FOR EVERY TYPE OF OIL!

Model 750-C

Model 200-S

Model 135-S

Model 78

Model 500-C

Models F-155 F-120

Models 272-C 363-C

Models 750-2C 750-3C

ONLY A GENUINE Luber-finer PLUS A GENUINE LUBER-FINER PACK

CAN GIVE THE EXCLUSIVE PATENTED FILTERING PROCESS THAT HAS MADE LUBER-FINER THE Standard Of The Industry Since 1936

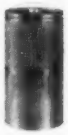
MODELS 78, 135-S, 200-S, featuring single-bolt lid, screw-in type pack, and overall compact design for use where space is limited. These Models provide the ultimate in filtration for passenger cars, small trucks and tractors, and other similar engines up to 5-quart, 6-quart, and 7-quart crankcase capacities.

MODELS 272-C and 363-C, featuring the Luber-finer single-bolt lid clamp, O-Ring lid gasket, screw-in type pack, and rugged construction throughout. Designed for heavy-duty service on gas, gasoline or diesel engines up to 3-gallon and 4-gallon crankcase capacities.

MODELS 500-C and 750-C, featuring the Luber-finer single-bolt lid clamp O-Ring lid gasket, large-capacity packs, and extra rugged construction to withstand the most severe service. Designed for use on gas, gasoline or diesel engines up to 5-gallon and 8-gallon crankcase capacities. Also widely used on fuel lines, hydraulic oil systems, and many other industrial applications.

MODELS 750-2C & 750-3C, featuring the Luber-finer single-bolt lid clamp, O-Ring lid gasket, and multiple packs for extra large capacity. Available with either wall or floor mounts for industrial use on engines up to 35-gallon sump, fuel lines up to 15 GPM, hydraulic oil systems up to 450 gals. For larger capacities, two or more Units can be connected in parallel.

MODELS F-120 and F-155, for gasoline and diesel fuel lines on mobile, stationary, or marine applications. Extremely efficient in removing impurities and contaminants from fuel. Single Units will handle flow rates from 0.5 to 1.0 GPM on suction or gravity flow. For larger capacities, connect two or more Units in parallel, or install on pressure-side of fuel pump.



GENUINE LUBER-FINER PACKS available in two types...

DIESELPAK — Expressly designed and recommended for use with all detergent-type compounded oils. Has the ability to remove the most finely dispersed contaminants without removing or affecting the additives.

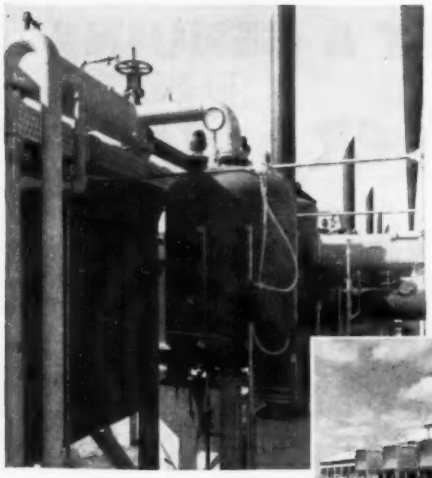
REFINING PACK — For use on straight mineral oil, synthetic oils, diesel fuel oil, hydraulic fluids, etc.

★ THERE IS A GENUINE LUBER-FINER MODEL FOR PASSENGER CARS, TRUCKS, TRACTORS, STATIONARY AND MARINE ENGINES, HYDRAULIC OIL SYSTEMS AND MANY INDUSTRIAL APPLICATIONS.

WRITE FOR COMPLETE INFORMATION TO DEPT. 52

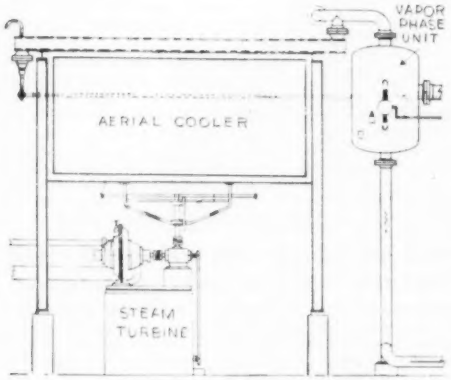
LUBER-FINER, INC. 2514 S. Grand Ave., Los Angeles 7, Calif

UNITED GAS PIPE LINE CONVERTS TO VAPOR PHASE



Eliminates Engine Power for Driving Turbine Fan . . . Utilizes Power Cylinder Waste Heat

In January, 1954, United Gas Pipe Line Company installed Vapor Phase Thermal Circulation on five 880-bhp gas engine compressors at their Agua Dulce, Texas, gas compressor station.



During September, 1956, one fan-drive was converted to the Vapor Phase Steam Turbine Fan Drive (utilizing power cylinder waste heat as steam at 15 p.s.i.g. pressure), thus eliminating engine power formerly required to drive the fan for lube oil cooling and steam condensing.

"Sole Developers and Manufacturers of Vapor Phase Thermal Circulation (Ebullition) Engine Cooling"

E C
VAPOR PHASE

ENGINEERING CONTROLS
Incorporated
AN AFFILIATE OF ST. LOUIS SHIPBUILDING & STEEL CO.

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news of our industry

Bright Outlook for Allis-Chalmers

President Robert S. Stevenson likes the looks of 1957. Prospects for all six operating divisions of Allis-Chalmers are rosy. He looks for gains in all industrial and farming equipment production. Backlog of orders is 40% higher than a year ago.

Oxy-Catalyst Exhibit

At the Materials Handling Show, a catalytic exhaust purifier for diesel engines, and two other models, will be demonstrated for the first time by Oxy-Catalyst, Inc. on April 29 in Philadelphia. Charts displayed in the booth will show the percentage of carbon monoxide eliminated by these catalytic purifiers from LP-gas, gasoline and diesel engine exhausts.

Kaibab Lumber Co. buys 8 Diesel Trucks

Newest Kenworth additions to Kaibab Lumber Co. of Fredonia, Arizona are eight heavy-duty Model 923 drop-frame conventional trucks. These highway trucks are powered by Cummins DHB-600 diesel engines, delivering 200-hp.

The trucks have a chassis weight of 13,530 lbs for these sleeper cab units which includes water and all lubricants and will be used for intrastate hauling from the Company's mills and sales office to consumer customers.

First U. S. Installation For New Enterprise V-type Engine

The recently announced Enterprise RV-16 engine to be installed in the municipal.generating plant at Waverly, Iowa will be the first domestic installation of this newly developed engine. To be installed during the summer months, it will be ready for operation in September.

With a top rating of 7700-hp at 400-rpm, the RV-16 is reported by Enterprise to be one of the most powerful 4-cycle diesel engines for its size. This new engine will boost Waverly's total capacity to 9490 kw.

news of our industry

AERA Convention Coming

For all interested in rebuilding engines and engine components, mark May 12-15 on your calendar. That is the date Automotive Engine Rebuilders Association will meet in Detroit to clarify engine rebuilding problems and give slants on merchandising that service.

Subjects to be discussed include "Cracked Block and Head Repair", "Mechanic Education and Training", "Fuel Injections" and "Detached Unit Service".

Extensive exhibits of replacement parts, machine shop equipment and related parts will be a feature of the AERA Convention.

More and More Road Machines

Our nation's road-building program getting into high gear and the economy of using modern machines mean accelerated rate of additions and replacements by highway contractors. This demand for all types of highway construction equipment will reach 94,000 units in 1957, predicts the American Road Builders Association. In dollars this means 900 million worth of new equipment sales. On top of this, highway maintenance organizations will need 50,000 units or $425 million. Added up, that's 144,000 units or a cool $1.2 billion of highway construction and maintenance machines.

Letourneau To Re-Enter Earthmoving Field

Robert G. Letourneau, President of R. C. Letourneau, Inc. of Longview, Texas announces that his company will re-enter the earthmoving field after an absence of five years. In discussing plans to re-enter the industry, Mr. Letourneau referred to the sale of the company's earthmoving business to the Westinghouse Air Brake Company four years ago. Included in the sale was an agreement that the firm would refrain from building and selling earthmoving equipment for a period of five years, ending May 1, 1958. New equipment will be marketed under a new trade mark, "Argee" instead of "Let" or "Letourneau".

(*Ind. News Continued on Page* 104)

THIS PARK DIE-FORGED CRANKSHAFT WEIGHS 3500 POUNDS

. . . is typical of 25 models from 1500 to 5000 pounds, made for diesel and gas engines

This "six throw" crankshaft, almost 12 ft. long, is representative of the large die-forgings Park supplies to manufacturers of gas and diesel engines.

Park's facilities include a complete die-sinking shop, modern specialized heat-treating equipment and experienced metallurgical and engineering staffs.

Our sales engineers will show you how Park die-forgings can increase strength and safety—cut down size and machine time on your requirements.

Die Forging Specialists Since 1907

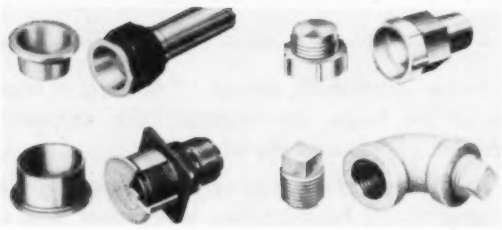
THE PARK DROP FORGE CO.
775 EAST 79TH ST. • CLEVELAND 3, OHIO

Carbon, Alloy, Heat-Resistant Alloy, and Stainless Steel Closed-Die Forgings from 4 lbs. to 5000 lbs.

new products

Added Range for Nylok Inserts

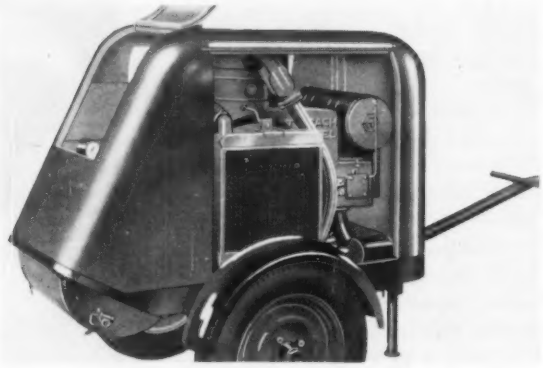
News of an increase in the range of threaded inserts with the Nylok self-locking principle, comes from that Corporation. Sizes now range down to #0. Government-approved, these inserts eliminate need for special tools, tape or counterboring and can be installed in a standard threaded hole and removed with a screw driver. Nylock states they withstand severe vibration and extreme temperatures from −70° to above 250° F.



Dirt and Moisture Seals

Use of closures for sealing openings in injection equipment, engine assemblies and components can spell protection during disassembly, storage or transit. Such caps and plugs, besides being dirt proof, are almost dirt cheap.

Protective Closures now offers an expanded line of easy-to-use Polyethylene CaPlugs in ten different designs and over 300 sizes. To request samples or a handy file folder giving complete data on these convenient closures, just jot it down on the DIESEL POWER reply card in this issue.



Compact "Angle-Type" Air Compressor

A new compact, low-cost, diesel-driven air compressor is being marketed by the JW Division, Cerlist Diesel, Inc. A feature contributing to its compactness is the "angle-type" construction of the engine-compressor. It is a Jenbach unit, imported from Europe and incorporated with tank, controls, etc., on a trailer-type mounting.

This 4-cycle engine-compressor unit, though European-built, was designed by Dr. List who is currently developing a new line of Cerlist engines to be built in this country. The power cylinder has a 4.92-in. bore and 5.71-in. stroke and is located horizontally. The piston is connected to the roller bearing-mounted crankshaft by a master connecting rod to which a link rod is attached for actuation of the compressor piston in the vertical compressor cylinder.

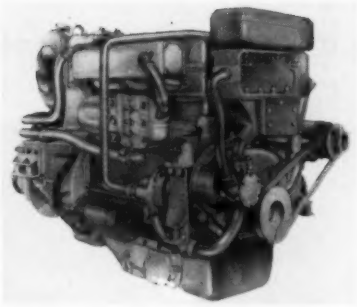
The engine cylinder with its 21:1 compression ratio is rated 20 hp at 1500 rpm. The 5.41-in. by 5.51-in. compressor cylinder is rated 78 cfm at 100 psi discharge pressure.

This rugged unit is completely self-contained, having all the necessary systems to go right to work.

Better Gear Lubrication

Why all this worry over gear lubrication? New gear design, greater tooth pressure, higher torque values and heavy work schedules, say Lubrication Engineers, Inc., all demand more efficient lubrication. So LE has come up with their answer to good gear operation by developing two new multi-purpose gear lubricants—509 and 510.

These improved products resulted from intensive and prolonged calculations and tests to determine the exact type and precise amount of extreme pressure agents needed to prevent scuffing, galling and seizure of heavy duty gears under even severest operating conditions. The basic oils selected for 509 and 510 gear lubricants exceed Timken-Detroit standards in every respect.

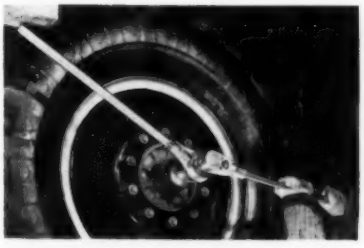


Three Hercules Marine Models

Hercules Motors Corp. has added three diesel engines to its marine line. Particularly suited for auxiliary power in large sailing vessels, the new 2-cyl DIX-2DM bows in with a 4¼-in. by 4½-in. bore and stroke. It produces 30 hp at 1800 rpm.

Model TCD-283M is a turbocharged version of the Hercules DIX-6 engine. With a 3⅞-in. by 4-in. bore and stroke, this new 6-cyl marine diesel produces 160 hp at 3000 rpm.

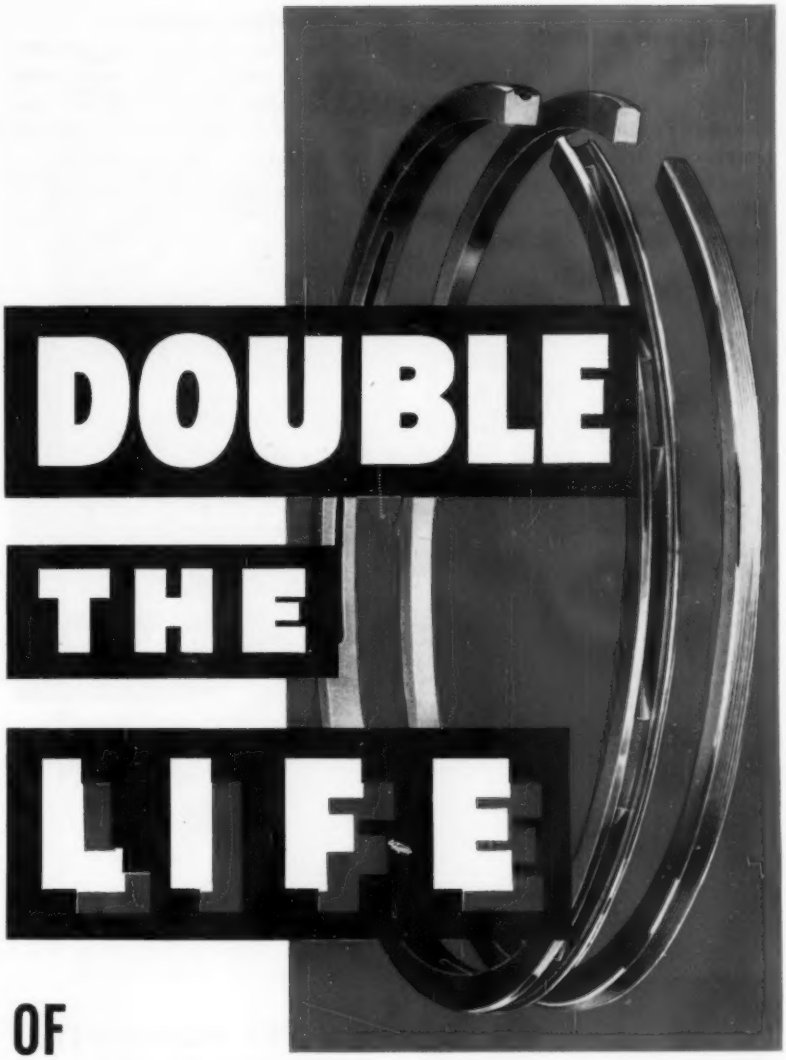
For use as a single propulsion unit or adapted for multiple unit installation, the turbocharged, 4-cyl TCD-183M with a 3⅞-in. by 4-in. bore and stroke is a compact engine delivering 105 hp at 3000 rpm.



General Utility Tool

This new X-4 Wrench Booster allows one man to do the work of four in loosening or tightening high-torque, threaded parts such as this axle nut. Used with standard socket wrenches, the compact geared-head tool boosts wrench turning force four times, says X-4 Corp.

The heart of the unique Wrench Booster is a set of planetary gears built into a simple concentric tool head. It can be completely dismantled in seconds for cleaning or lubrication.



OF CYLINDERS, PISTONS AND RINGS!

Perfect Circle piston rings are plated with thick wear-resisting solid chrome that *more than doubles* the life of cylinders, pistons and rings. Records prove PC Chrome-Plated piston rings give more hours of sustained power... more hours between overhauls.

Leading diesel manufacturers use Perfect Circles as original equipment and recommend them for replacement service because they know Perfect Circles can be depended on for top performance under the most grueling conditions. Many types of Perfect Circles, designed specifically for diesel applications, are available.

The Perfect Circle engineering staff will gladly assist you with your piston ring problems... no obligation of course. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., 888 Don Mills Road, Don Mills, Ontario, Canada.

PERFECT CIRCLE

PISTON RINGS

More people prefer Perfect Circles than any other brand!

Graybar Features Continentals

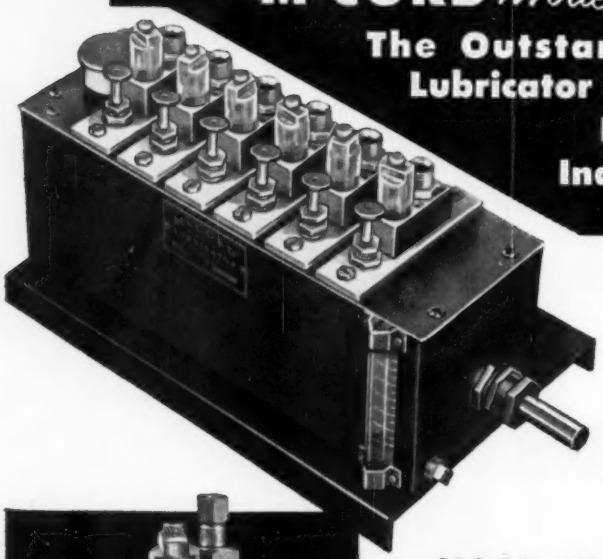
Graybar Electric has made available a line of generator sets, ranging from 400-w to 100-kw in gasoline, LP gas and diesel-powered units. Engines for the gas and diesel-powered sets will be supplied by Continental.

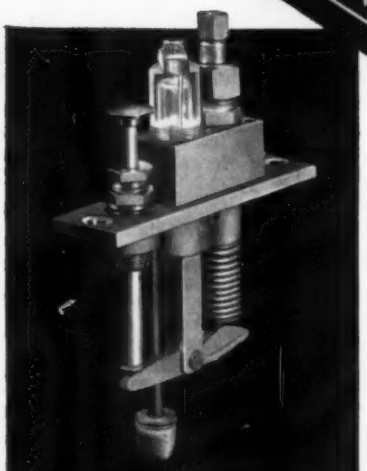
Temperature Regulator

Designed to withstand the corrosive effects of certain fumes, gases, acids and chemicals, a stainless steel temperature regulator is now offered by Fulton Sylphon Div. of Robertshaw-Fulton Controls. According to the manufacturer, the 11061-R regulator was developed for chemical plants, plating rooms, or for use in exposed locations.

FEATURES THAT MAKE McCORD *Model 55*

The Outstanding Lubricator in the Diesel Industry





McCORD Model 55 pumps are interchangeable with McCORD Type "SF"

MOST ACCURATE LUBRICATOR EVER DEVELOPED

1. DRY SIGHT FEED . . . No glycerine—No Maintenance.
2. CALIBRATED DROP . . . A McCord First—Makes the Model "55" the most accurate lubricator ever developed.
3. POSITIVE! . . . No possibility of undetected leakage.
4. UNIT CONSTRUCTION . . . Entire pump assembly accessible by removal of 2 capscrews.
5. HIGHEST PRESSURES . . . Easily handled with standard lubricator.
6. LONGER LIFE . . . Due to longer plunger and more sealing area.

SPECIFY McCORD AND BE SURE

Send for your copy of the interesting bulletin on McCORD MODEL "55" LUBRICATOR.

LUBRICATOR DIVISION McCORD CORPORATION · Detroit 11, Mich.

Turco Steam Cleaner

Easily attached to any 40 to 140-psi steam line, a portable injector unit developed by Turco Products, Inc. can be used for almost any type cleaning job. Called the Steamerette, the unit has a built in pressure gauge and is simply operated by the adjustment of one valve.

Low-Cost Fuel Series

White has an improved industrial diesel engine series 40, in 6-cyl and 8-cyl versions, which operates exclusively on low-cost fuel, either naturally-aspirated or turbocharged from 215-hp to 1025-hp.

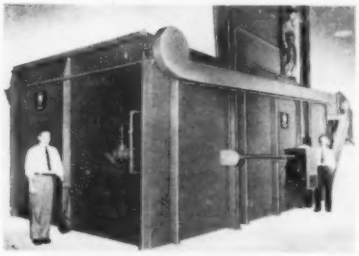
Small Circuit Breaker

The Circuit Protective Devices Dept. of General Electric has a compact 800-amp molded case circuit breaker which is said to be 6½-in. shorter than conventional breakers. Designated KM-Frame, it permits space saving in ultimate size of equipment, and simplifies stocking.

Wrench and Vice Chain

Morse Chain Co. has added WC-522 Wrench Chain to its line of industrial products. Primarily for chain wrenches and vices, the new chain may be used wherever strength-in-tension, flexibility, and quick, easy changes in chain wrap are necessary. Extended pins on both sides, each pitch, provide this quick, positive locking action. Natural flexibility permits it to hold any material firmly without scratching.

new products



Blockbuster Cleaner

Magnus Chemical Co. has announced its latest Aja-Dip king-sized cleaner which takes care of 14,000 lb of parts at one time.

Specifically made for washing 6-wheel truck assemblies and engine blocks and parts, it measures a mammoth 35 ft long by 15 ft wide by 20 ft high. The 40-hp motor with fluid coupling provides the power for raising and lowering the part carrier through an 8-in. stroke with 52 up and down swishing motions per minute.

A meek monster, it operates simply with two push buttons—one for lifting and lowering the cover, another for starting and stopping the agitation motor.

I-H Introduces Diesel

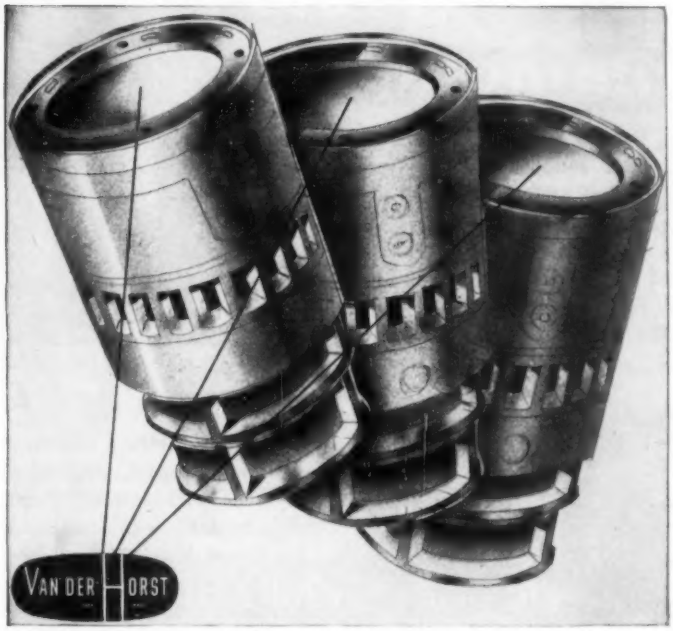
Smallest model of the International Harvester line, the new UD-281 diesel power unit has been announced by the Construction Equipment Division. The 4-cyl engine has a 60-hp rating at 1800 rpm, five more than the model it replaces. The 4-⅛ in. by 5¼ in. bore and stroke gives a piston displacement of 281 cu in.

Course and Fine Lapping

A dual agitator tank attachment, permitting both course and fine lapping on the model 24 Lapmaster, is available from Crane Packing Co. It uses course abrasive in one tank and fine abrasive in the other. In cases where lapping tolerances are not critical it is unnecessary to change laps and conditioning rings when switching from one tank to the other.

(*Continued on Page* 112)

5 *big advantages of*



PORUS - KROME

Good for the Life of your Engines

PORUS - KROME	INCREASES PISTON RING LIFE UP TO 50%.
PORUS - KROME	INCREASES CYLINDER LIFE 3 TO 5 TIMES.
PORUS - KROME	DEFINITELY CONTRIBUTES TO A REDUCTION IN LUBE OIL CONSUMPTION.
PORUS - KROME	DEFINITELY CONTRIBUTES TO REDUCED DOWNTIME FOR ENGINES.
PORUS - KROME	ELIMINATES STOCKING OF OVERSIZED PISTONS AND PISTON RINGS.

Write today for detailed information

Address -

Dept. C-3, VAN DER HORST CORP., OLEAN, N. Y.

OLEAN, NEW YORK

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VAN DER HORST

TERRELL, TEXAS

LOS ANGELES, CALIFORNIA*

*SparTan Engineering

organizational news

Two New Buda Managers

L. C. Daniels is now general manager of the Buda Division, Tractor Group, Allis-Chalmers Mfg. Co., succeeding R. K. Mangan, president, who recently retired. Owen J. Higgins is promoted to general manager of the Harvey, Ill., Works where material handling equipment and diesel engines are manufactured.

N. I. Glassey

Thomas Hess

American MARC Promotions

With Hallett Manufacturing Co. for 15 years, Russell G. Livingston has been appointed vice president of sales for American MARC, Inc. Wren Jones, also with Hallett for 6 years, was advanced to parts and service manager. Last year American MARC purchased the Diesel Engineering Div. of Hallett.

Owen Higgins

L. C. Daniels

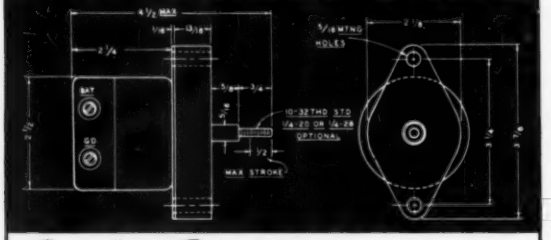
Two Join Hartford Machine

As a move toward increased activity in the injection field, Thomas D. Hess, formerly with American Bosch, has joined Hartford Machine Screw Co. as field engineer and Norwood I. Glassey has been made sales representative covering the mid-west.

R. Livingston

Wren Jones

D.C. SOLENOIDS



Synchro-Start **SS SERIES SOLENOIDS**

are for operating engine throttles, fuel pump racks, chokes, etc. and are available with several variations.

VOLTAGES (D.C. Only)
6V. 12V. 24V. 32V.

CURRENT DRAW (Pulling)
50A. 30A. 17A. 7.5A.

CURRENT DRAW (Holding)
1.7A. .95A. .28A. .25A.

DUTY
Continuous

CYCLES
Not to exceed 6 per minute

PULL
Approximately 10 lbs. over ½" stroke

WEIGHT
2¼ pounds

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVENUE · SKOKIE, ILL.

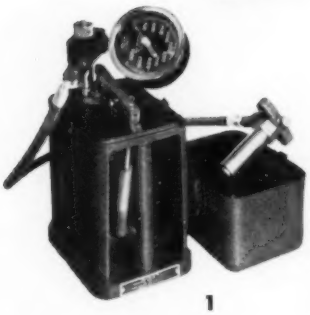
"TORQUE WRENCH" MANUAL

Sent upon request

Formulas
Applications
Engineering data
Screw torque data
Adapter problems
General principles

P.A. STURTEVANT CO.
ADDISON QUALITY® ILLINOIS
Manufacturers of over 85% of the torque wrenches used in industry

KIENE® diesel engine test equipment



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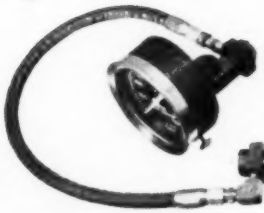


2

3

4

Kiene Adapters and Connectors available for all makes and models of diesel engines manufactured in U.S.A.

1. **Model KTP-50, Hydraulic Test Pump . . . designed for field service . . . portable . . . no bolts or clamps for leverage . . . many novel features.**
2. **Model K-120, Universal Indicator . . . for high-speed automotive type diesels...can be adapted to larger engines for firing pressure readings.**
3. **Model V-10, Indicator Valve . . . rugged . . . will not blow open . . . adaptions for all locomotives.**
4. **Model K-100, Cylinder Pressure Indicator . . . simple . . . accurate . . . for compression and firing pressures on large horsepower engines.**
5. **Model UTS-10, Portable, Universal Unit Injector Test Stand . . . checks all sizes in one fixture.**

Kiene Diesel Engine Test Instruments are recognized throughout the industry for their accuracy and adaptability. They are designed for long service under most severe field conditions. Kiene equipment assures the proper maintenance of diesel engines . . . helps prevent costly down time. Get the facts on Kiene before you invest in diesel test equipment.

Send for Descriptive Literature

KIENE DIESEL ACCESSORIES, INC.
BOX 216, FRANKLIN PARK, ILLINOIS

organizational news

William H. Reed

REA Vacancy Filled

The important position of Head, Internal Combustion Plants Section, Electric Engineering Div. of Rural Electrification Administration, has been taken over by William H. Reed. This post has been vacant since the untimely death of Everett J. Rausenberger. Mr. Reed, Syracuse graduate, has substantial experience in diesel plants and has been with REA since 1946.

KATO
THE GENERATOR THAT FITS THE ENGINE OF YOUR CHOICE!
ADAPTABLE TO ALL ENGINES WITH SAE BELLHOUSING
CHOICE OF FLEXIBLE COUPLINGS
INPUT 60 CPS
OUTPUT 400 CPS

There is a size in the Kato line of generators with the electrical characteristics to meet your specific requirements. Each hooks up with any standard industrial diesel or gasoline engine by means of one of Kato's flexible couplings. All standard frequencies . . . 25-50-60 and 400 cycles plus many special frequencies to 1200 cycles (both fixed and variable). 60 cycles to 400 KW. Extra lead wires brought out insure a maximum voltage selection.

- Single Bearing
- Standard 2-Bearing
- 2-Bearing Close Coupled (desirable for engine driven 400 cycle generators).

MOTOR GENERATOR SETS

Wide variety of both fixed and variable frequency ranges starting at 25 cycles, up to 1200 cps. 400 cycle line now up to 250 KW.

SPECIAL ORDERS WELCOMED!

Builders of Fine Electrical Machinery Since 1928

KATO *Engineering Company* 1408 FIRST AVE. MANKATO, MINNESOTA

WRITE TODAY FOR FOLDER . . . IT'S NEW!

"Hey! I hear NORDBERG has

"Yes, sir. They use aluminum bearings in their big gas-burning radial engines and haven't had a failure. Guess it's because only aluminum can handle 10,000 psi on projected area."

"More likely, it's because aluminum runs 20° cooler than ordinary bearings. You know, less burnouts and seizures."

organizational news

Magnaflux Corporation's

Board of Directors have elected Roy O. Schiebel as 2nd Vice President of the corporation.

Mr. Schiebel brings 17 years of sales and management experience gained during the growth of Magnaflux. Working with many industries all across the country, he has pioneered many testing applications and improvements.

He also did some early work with the railroads, in connection with testing problems connected with conversion from steam to diesel power.

Roy O. Schiebel

C & D Batteries Appoints

Charles P. Michalski as project engineer to head up their stepped-up research plans for railroads, mining and other industrial applications. For the past 30 years Mr. Michalski was with Gould Batteries.

Marketer to Detroit Aluminum

As new marketing manager for Detroit Aluminum & Brass Corp., Phil Summerland will work directly with distributors and jobbers to further company expansion plans. Mr. Summerland was formerly with Thompson Products.

Oakite Adds to Technical Staff

Six men have been added to the nation-wide technical service organization of Oakite Products, Inc. Robert H. Bourbonnais has been assigned to Lansing, J. C. Ruttle to Detroit, Harry H. Thomas to Cedar Rapids, William G. Caffee to Birmingham, Theo L. Matula to San Antonio and Andrew C. Johnston to Washington, D. C.

GM Research Promotions

John M. Campbell is appointed scientific director of General Motors and Arthur F. Underwood is elevated to manager of research staff activities. Gregory Flynn, Jr. succeeds Mr. Underwood as head of the mechanical development department.

Shifts at Nordberg

Stephen H. Reed steps in as sales engineer at Nordberg Manufacturing Co. while G. "Burke" Wright succeeds Louis Rove, now retired, as Great Lakes district manager. H. E. Fellows is appointed manager of the Power Chief Engine Department.

1957 ARBA Slate of Officers

has been installed. Julien R. Steelman was elected president and Jennings Randolph, treasurer. Serving as vice presidents are J. E. Mc Cracken, Northeastern District, Nello L. Teer, Southern District and W. A. Bugge, Western District of the American Road Builders Association.

racked up over 40,000 hours on these Alcoa® Bearings!"

"I hear aluminum bearings roll the dirt particles right out. They embed better than bronze, but not as deeply as babbitt. Oil additives won't corrode them either."

"Do you know that solid aluminum bearings have no hard backing? They can't damage shafts if they fail. They also eliminate the bond fatigue problem since they're monometallic."

"The word is getting around that solid aluminum bearings, cast by Alcoa and machined by leading bearing manufacturers and users, are just about perfect. More information? Write Aluminum Company of America, 1988-D Alcoa Bldg., Pittsburgh 19, Pa."

organizational news

At Socony Mobil Oil Co.
Robert Q. Sharpe is the new chief engineer of the Industrial Division and A. C. Stutson takes over as ass't. manager of publications and training for the lubricating department.

H. O. Penn Personnel
Robert Van Riper is the new general parts manager at H. O. Penn Machinery Co. while John N. Tantillo takes over as N. Y. parts manager of this construction and industrial equipment concern.

Garlock Unifies Staffs
The sales force of United States Gasket Company has been absorbed by the Garlock Packing Company. This latest move completes the integration of the staffs, services and facilities of the two firms and will simplify purchasing with a single supply source for every type of seal.

De Laval General Manager
H. B. Bradshaw, with the De Laval Separator Company since 1940, has been appointed general manager of the midwestern office located in Chicago.

Harnischfeger Export
Odis Small, Jr. has been assigned to Harnischfeger Export Corporation where he will handle P & H diesel engine sales throughout the world. Thomas J. Kemble replaces Mr. Small as mgr. of railroad sales for Harnischfeger.

Gould-National Ups
K. A. Vaughan, with the firm for 30 years, to export manager, Industrial Division. Besides sales of industrial batteries abroad, he will handle railroad and national accounts in New York. Lewis L. May, Jr. takes over as gulf regional manager of Gould-National Batteries, Inc. and Carson I. Simms becomes manager of utility sales. The new manager of field engineering is R. W. Hopewell.

Farris Sales Post
Wilfred McGregor is now divisional sales manager for Farris Engineering Corp. and its two affiliates. In his new capacity, Mr. McGregor will supervise sales of governors, diesel engine speed controls and valves.

Robertshaw-Fulton Elects
John A. Robertshaw as vice president. A grandson of one of the founders, he has served this controls concern in a wide variety of posts.

After 40 years of service, Chauncey N. Mynderse retired as vice president and director of the Fulton Sylphon Division of Robertshaw-Fulton Controls.

John A. Robertshaw

(*Continued on Page* 114)

new literature

Low-Down on Air Compressors

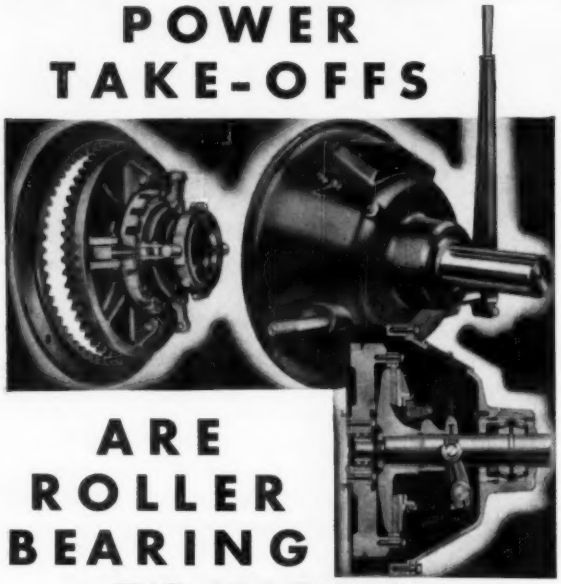
The new booklet released by Air Compressor Research Council spells out just how to select the right size and type air compressor for the job. Many helpful charts make it easy to determine exact requirements. It also gives daily, weekly and monthly maintenance check lists.

Largest I-H Crawler

International Harvester shows on-the-job photos of the huge 6 cyl, 200-hp TD-24 crawler tractor in Bulletin CR-565-G. Besides giving detailed specifications, the maneuverability of this model is pointed up by diagrams of steering clutch positions for gradual, feathered and pivot turns.

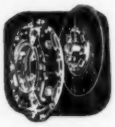
ROCKFORD

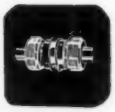
POWER TAKE-OFFS



ARE ROLLER BEARING EQUIPPED

Small Spring Loaded


Heavy Duty Spring Loaded


Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

SELF CONTAINED UNIT
WIDE RANGE OF SIZES
CONSERVATIVE RATING
ROLLER BEARINGS
FINE ADJUSTMENT
ACCURATE BALANCE
S.A.E. DIMENSIONS

* ROCKFORD POWER TAKE-OFFS are equipped with roller bearings of ample proportions to carry the loads to be placed upon them. Provision is made for adjusting the tapered roller bearings that support the shaft. These and the clutch release bearing can be lubricated from outside the housing.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD Clutch Division BORG-WARNER

1301 Eighteenth Ave., Rockford, Ill., U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

Brief, Data-Packed A-C Bulletin

explains at a glance usable horsepower at various speeds, applications and altitudes. Included in this Buda Division folder are charts for gasoline, LPG, natural gas as well as diesel oil field engines.

PT Fuel System Questions

are answered in the clearly illustrated booklet by Cummins Engine Co. Cutaway views of four PT fuel pump assemblies and the PT injector make it simple to understand the inner workings of the diesel fuel system. A section of this worthwhile folder is devoted to optional governor arrangements.

Goulds Pumps Keep Tabs

If you're not keeping maintenance records on your pumps, you should. Goulds Pumps, Inc. make it mighty easy for you. They offer a supply of card forms for each of your pumps. Adequate records help in diagnosing pump failures, ordering and stocking repair parts, setting up lubrication, maintenance and overhaul schedules.

Delta Drill Presses

Twelve pages of facts on Delta drill presses for every production and shop need are given in the bulletin just issued by Rockwell Mfg. Co. Floor, bench, single and multiple spindle models in several basic sizes are described—from the heavy-duty 20-in. unit for production tooling to a 14-in. low-cost, utility drill press.

Cat Issues Catalog

Pictured in the new Caterpillar folder are D2, D4 and D6 tractors hard at work. Capacities and specifications of these compact machines are covered. Cat points out many features of their big tractors—the oil flywheel clutch, among others—are now incorporated in these small models.

Batteries for Diesels

Gould-National Batteries has issued Bulletin GB-1078B which cites construction details and advantages of the Kathanode diesel locomotive starting battery. Connecting diagrams and application for various diesel locomotives are also given.

new literature

No-Skive Hydraulic Hose Fittings

Re-usable Hoze-lok fittings for rubber-covered double-wire braid hose for high-pressure service are described in the new leaflet issued by Parker Appliance Co. Fittings, which do not require hose cover to be stripped off, are offered with four different connecting ends detailed in the bulletin.

Water Protection

Users of distilled water systems, such as those for water jackets on some railroads and for battery maintenance, will be interested in Bulletin No. 139 just issued by Barnstead Still and Demineralizer Co. It tells how purified water may be piped without metallic or other contamination through the use of Barnstead tin-lined piping and accessories. The full line of 1/16-in. thick tin-lined pipe, fittings, line valves, faucets and accessories, developed to protect such systems, are described in the bulletin.

Quarter Century of Diesel Service

Caterpillar Tractor Co. marks its 25th year of service to the industry by publication of a booklet "A Quarter Century of Diesel Leadership". It tells the story of this Company's many engineering achievements since its entrance into the field.

Among the topics discussed are the incorporation of a production diesel engine in the crawler tractor, the Caterpillar fuel injection system, the development of detergent oils, induction hardening of cylinder liners and camshafts, the use of aluminum alloy main and connecting rod bearings and other notable "firsts".

Illustrations, with engine application and history, depict installations where early model Caterpillar diesels are still on the job. Also shown is the Company's complete current line of diesels represented in various power arrangements — industrial power units, self-regulated electric sets, spark-ignition engines designed to burn natural gas, torque converter units, twin arc-welders and marine diesel engines.

Flat-Type Motors

Several models of flat-type motors for machine tool and equipment makers are detailed by Diehl Mfg. Co. in Bulletin No. 3461. Included are both the Type "DIE" totally-enclosed, non-ventilated flat-type motor and the Type "DIF" totally-enclosed fan-cooled model. The bulletin lists ratings of both space-saving motors and compares the size and weight of the various Diehl flat-type models with standard motors of equivalent horsepower.

Predetermined Locking Torque

American Sealants Co. has prepared a file folder on their Loctite sealing system for predetermining locking torque for any fastener application.

Their liquid lock, they state, provides a gripping action over the entire surface of engaged threads resulting in 1½ times the gripping action of a jam nut of the same thread and diameter. Loctite sealants are available in a number of grades for controlled torque for any application.

SERVICE
--FAST
Quincy
COMPRESSORS
With over one hundred Quincy Authorized Service Depots across the country, you are never far from the factory parts you may need for *any* Quincy Compressor. And experienced Quincy service people know the importance of 'round-the-clock air power on your job, so you can be sure they'll follow through when you specify "fastest way."
Quincy makes a compressor for every diesel, marine, oil field and industrial use from 1 to 90 CFM.
Write Dept. J-54 for descriptive catalog today.
Quincy
COMPRESSORS
FOR LOW COST AIR POWER
QUINCY COMPRESSOR CO., QUINCY, ILLINOIS

new literature

Channel-Flo Compressor

The inside story of a new compressor for shop air and other uses where moderate capacities are required is told in a factual catalog by Ingersoll-Rand. Named the "Channel-Flo", it is a 2-stage, 200-psig rated motor-driven compressor now available in 1½ and 2-hp. This compact compressor is engineered for versatility of mounting.

Industrial Power Diesels

Detroit Diesel Engine Division, GM, offers a 19-page catalog outlining its complete line of power units for industrial applications. Specifications and capacities are given on 31 models ranging from 44 to 761 bhp, including the new Turbopower engines.

All their 2, 3, 4 and 6-cyl diesel engines within their own series have the same bore and stroke. This allows maximum interchangeability of moving parts—from 60% to 70%, Detroit Diesel emphasizes.

these high-speed PERKINS diesels

offer exceptional advantages

to equipment manufacturers interested in export sales!

PERKINS P-3
3 cylinder lightweight engine which develops 32 H.P. at 2000 rpm. Also has a wide range of other applications—such as generating electric power (as shown above).

Not only are Perkins diesels world-renowned for reliability and economy but their use in your equipment affords you a unique export sales advantage. Because Perkins sales and service facilities are established in 118 countries of the world.

This means, of course, that your equipment can be shipped complete with fullest assurance of service to the user . . . or, if the user prefers, it can be engined at the destination thus reducing both shipping weight and dollar content.

These are reasons why more United States manufacturers are turning to Perkins for diesel power. Your enquiries will be welcome.

Perkins

F. Perkins (Canada) Ltd.
60 Wingold Ave.,
Toronto, Ontario, Canada.

5702

Guide for Good Relations

As technology advances, day-to-day contacts on the job exercise ever-greater impact on output and costs. As a practical guide for better supervisor-employee relations in the plant, the National Association of Manufacturers has written a 32-page handbook on "Improving Human Relations". Copies can be secured direct from that organization.

GE Drive System

GE tells how Electric Drive works for you in their new 4-page folder. With cutaway sketch of a 25-ton diesel-electric locomotive, General Electric explains step-by-step operation of their electric drive system. Simplicity and advantages of the GE system for railroad and industrial locomotives are quoted.

Balanced Bushed Roller Chain

New book No. 2454 by Link-Belt Co. on LXS bushed roller chain will interest users of machinery drives in some type of construction units, such as travel and steer mechanisms on shovel-cranes, jack shafting on crushers and batchers.

The balanced design of LXS chain, Link-Belt points out, provides extra strength, increased wear resistance under severe conveyor and drive conditions and wider applicational flexibility. These features, plus application and selection data, are detailed in the booklet.

Greater Road Equipment Output

Handsome handbook by Allison Division, GM, has a wealth of facts and figures on how hydraulic drive multiplies machine and manpower output. Profusely pictured and described are their TC 200-300 Series Torqmatic drive converter, TG 600 Series transmission, CT-CRT 3000 Series all-purpose and CBT-CRT 5000 Series king-size, one-package Torqmatic drive systems. All series illustrated are single-stage, 4-element converters, except series 300 which is a 3-element converter.

Installations included in this Allison manual point up how Torqmatic drive teams up for faster work-cycle and heap loads.

new literature

New Line of Magnetic Cranking Switches

is illustrated and described in a new catalog sheet just released by the Leece-Neville Co. A detailed description of the product together with complete specifications, wiring diagram and comprehensive application information are all included in this publication.

Answers to Fastener Problems

are dealt with in the 12-page catalog of stainless steel "An" fasteners published by Allmetal Screw Products Co. may be able to answer your questions.

Machine screws, rivets and bolts are among the items discussed and illustrated.

Detroit Diesel's 2-Cycle Power Units For Oil Field Use

are covered in a 16-page brochure just released.

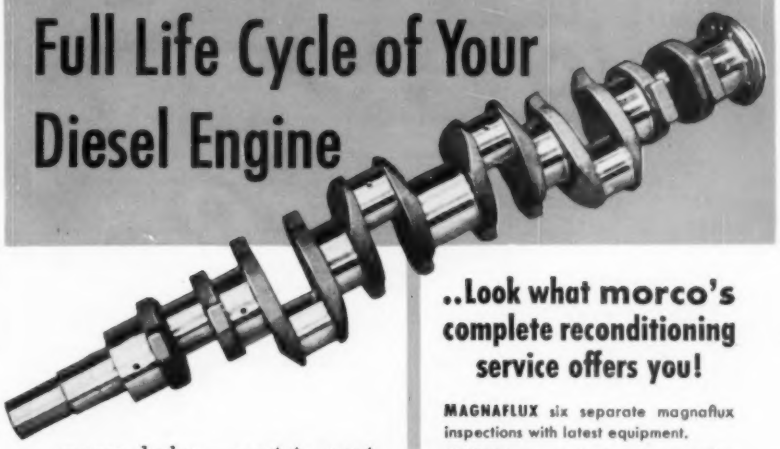
Described are the Division's new Turbopower models, diesel-electric sets, single and multiple-engine units, torque converter models and marine propulsion units.

Effective Filtration

A new 16-page catalog shows how Air-Maze liquid filters provide full flow filtration of lubricating, hydraulic and fuel oils. It enumerates capacity and filtration ratings, specifications and dimensions for simplex and duplex models, large capacity and sump-suction units. There is also a section on special design filters—high pressure models, open circuit internal type and units with pleated type elements. If you already are using filters such as these or intend to in the future, this 16-page catalog is invaluable. The information is given in simple and concise form so that everyone can understand it. Use the DIESEL POWER return card in this issue and the catalog plus any other data desired will be sent to you at once.

(*Continued on Page* 116)

morco Factory-Certified Exchange Crankshafts give Trouble-Free Operation for the Full Life Cycle of Your Diesel Engine



morco dealers—coast to coast—are stocked with reconditioned, like-new crankshafts for different diesel engine models. Users of Detroit Diesel and Cummins engines can exchange worn shafts for MORCO factory-reconditioned shafts through authorized dealers.

Why take chances? Let your dealer be your source for dependable, safe crankshaft regrinding. You get immediate service, guaranteed quality and terrific economy. Ask your dealer about MORCO today.

..Look what morco's complete reconditioning service offers you!

MAGNAFLUX six separate magnaflux inspections with latest equipment.

GROUND on production type equipment to engine manufacturers' specifications. Original stroke retained.

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*TOCCO is a registered trademark of the Ohio Crankshaft Co.

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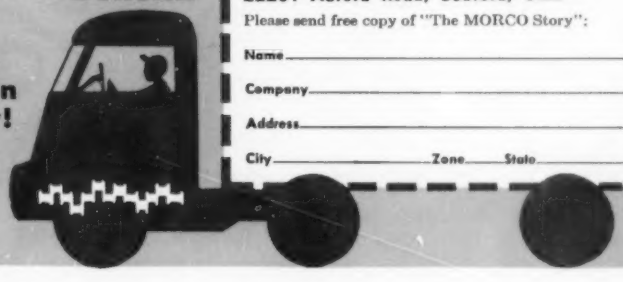

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Company_____
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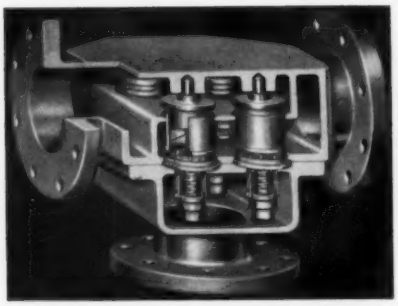

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SAFETY	Provided for by multiple independent elements as shown above.
✓	Provided for by rugged AMOT element construction. No AMOT element has ever stuck closed since its introduction 6 years ago. Many years of "know how" are built into every AMOT element.
✓	Omission of all hand operators means engine temperature is safe from tampering by engine attendants. AMOT is the only engine thermostat that can be considered safe without a hand operator.
✓	Lack of capillary tubes, bulbs, and packing glands means no failures from kinks or leaks.
SERVICE	There is only one replaceable part—the element. Renewal of element renews all working parts. Element replacement, if ever required, is several times faster than on any competitive make. Original accuracy of temperature setting is always provided in element replacement.
✓	AMOT engineers are available in most major cities to help on application and other problems.
✓	Most models are available from stock for rush orders.
MODELS	½" to 6" pipe sizes. Larger sizes in iron, bronze or ductile iron.

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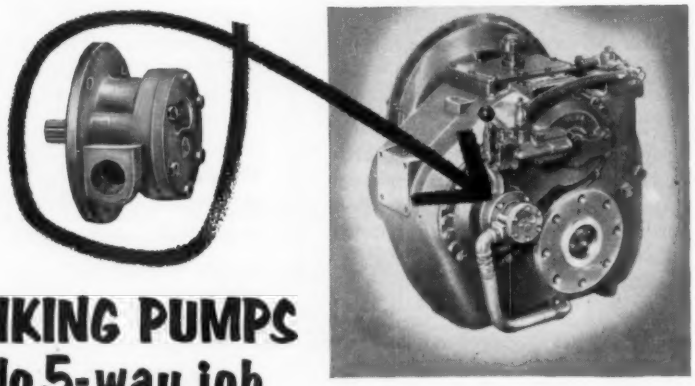

VIKING PUMPS do 5-way job on Twin Disc Clutch's New Marine Gear

Twin Disc Clutch Company, Racine, Wisconsin, designed their new MG-11 Marine gear for the new high speed, high horse power marine engines. They spent three years in research, designing, planning and testing. Viking Pumps were selected to perform five functions—1. Actuate the clutches, 2. Carry heat away from clutches, 3. Give smooth clutch engagements, 4. Reduce clutch plate wear, and 5. Force-feed lubricate meshing gears.

Besides marine use, Vikings are pumping dependably in petroleum, chemical, foods, and many other fields. If you have a pumping problem, call on Viking.

To start, write for bulletin 56S d.

VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, it's "ROTO-KING" pumps

See our catalog in Sweets

news of our industry

(*Continued from Page* 91)

Most Powerful Tugs

The first of two tugboats, the King's Point, rated among the most powerful tugs in the United States, was commissioned. It is powered by a 16-cyl Alco diesel, rated 2100-hp continuous, capable of 2400-hp emergency.

Cat-Trains Plough Through Snow Route

In a race against time and temperature, 24 diesel-powered sled trains work round the clock to get 30,000 tons of equipment and supplies from Thicket Portage on the Canadian National Hudson Bay line to the new giant INCO mining project 30 miles away. Expected to be in operation by 1960, the facility will be the world's second largest nickel-producer.

Action on Miehle Turbochargers

Expansion of facilities is under way at Miehle Dexter Supercharger. Hans Bohuslav, general manager of the Division, says they've taken over the Racine main works of J. I. Case Co. for research and development of a new line of high pressure turbochargers for automotive diesel engines.

The new turbochargers will supplement the present line of superchargers and rotary positive blowers made at the Christensen Machine plant. The high efficiency and increased pressure ratio of the turbochargers will add considerably to the power output possible from internal combustion engines of every size and type.

The acquired plant will house complete equipment for testing supercharged engines, calibrating turbochargers, as well as special machine tools for building prototypes.

To facilitate expansion plans, reorganization and mergers were consummated. The Miehle-Dexter Supercharger Division and the Christensen Machine Co. are part of the Miehle-Goss-Dexter group recently formed by merger of Miehle Printing Press & Mfg. Co., the Dexter Folder Co. and the Goss Printing Press Co.

news of our industry

Oil and Gas Power Division, ASME May Conference

Seven fact-filled sessions with ten technical papers and two panel discussions are set for the ASME, Oil and Gas Power Div. Annual Conference coming up in Louisville on May 20.

Of tremendous importance to the industry is the special lecture Lee Schneitter, Ebasco mechanical engineer, will give on "Residual Fuels for Diesel Engines". His extensive knowledge gained from many years experience in burning heavy fuels in power plants throughout the field notably qualifies him in presenting a bibliography of significant data and a summary of the known facts. His talk will provide a "threshold" for more fact-gathering in this important field.

Four authorities will head a discussion on "Engine Intake Air Conditioning" and another 4-member panel will discuss "Piston Rings for Oil and Gas Engines".

In preparing the program, emphasis was placed on problems of pipeliners and the marine field. However, there will be plenty of data vital to everyone. These are the timely technical topics scheduled:

"Variation in Marine Engine Performance with Departures from Design Conditions of the Propeller"; Chrome Plating Development at U. S. Naval Engineering Experiment Station"; "Sizing of Centrifugal Separators for Residual Fuels"; "The Use of Heavy Fuels on River Towboats with High Speed Diesel Engines"; "A Practical Engine Scope for Field Maintenance"; "A Study of Industrial Engine Operation"; "Effect of Intake Combustion-Air Conditioning on Performance of Gas-Fired Internal Combustion Engines"; "Turbocharger Development for the Two-Cycle Engine"; "Gas Pulsation—The Problem, SGA's Approach and Results" and "An Appraisal of Compressor Cylinder Cooling Requirements".

Some 32 exhibits by firms serving the industry will be shown at the OGP Louisville Conference.

GMC Truck Appointments

Charles R. Lewis has been named assistant chief engineer and Hans M. Gadebusch special projects engineer for GMC Truck and Coach Division. Mr. Lewis, was formerly chief engineer for General Motors-Holden's, Ltd., Australia, and Mr. Gadebusch was liaison engineer at GM Technical Center.

Truck Tonnage Continues

The volume of intercity tonnage hauled by truck is slightly above the 1955 average, but 16.1% over that hauled during the same period (third quarter) of 1954.

Safety Award

P.L.E.'s over the road and city fleets operating in Oregon have been awarded a Trailmobile Safety Plaque in the over five million mile class by the Oregon Trucking Assn.

SPECIALLY ENGINEERED FOR DIESEL ENGINE REBUILDING SERVICE

TOBIN-ARP MFG. CO.

Announces the NEW

PM 900D PIN FITTING MACHINE

SPECIALLY ENGINEERED TO PRECISION BORE

The PM 900D is a precision boring machine—capacity 21/32" to 2⅜". Connecting rod capacity 23". Boring capacity can be increased to 4⅛".

√CONNECTING ROD BUSHINGS
√CAM LEVER BUSHINGS
√ROCKER ARM BUSHINGS

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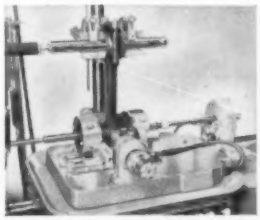
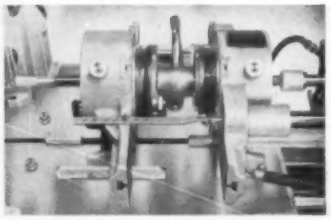
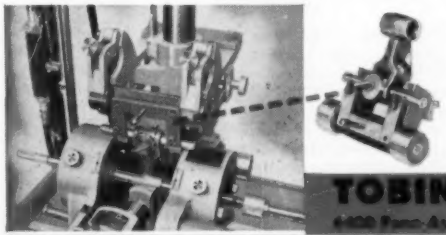


1 Precision boring piston pin bushing parallel with crank pin bore, to specified center-to-center dimension.



2 Precision boring rocker arm bushings in *less than one minute* per rocker arm.

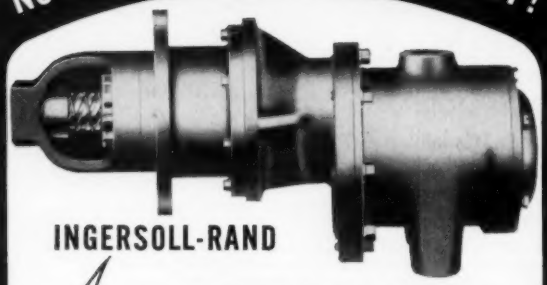


3 Precision boring cam lever bushings, parallel with roller shaft to specified center-to-center dimension, with Vernier Scale Control.

Write TODAY for complete information!

TOBIN-ARP MFG. CO.

NO BATTERIES TO WORRY ABOUT!



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Air STARTING MOTORS

give you trouble-free engine starts

RELIABLE—I-R Air Starting Motors are built for fast, sure engine starting—anywhere.

LOW COST—No batteries, generators or electrical parts to buy. Practically no maintenance expense.

COMPACT—I-R Air Starting Motors are lightweight, small but powerful. For all popular gasoline and diesel engine sizes. Easily installed.

Ask your engine distributor to show you the I-R Air Starting Motor line. Or write for Bulletin 5094A.

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Since 1910 The Original

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47 YEARS OF GUARANTEED SERVICE

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DIESEL ENGINE SERVICE

NIFE nickel Cadmium Batteries give guaranteed service after fifteen and twenty years of continuous operation, maintenance costs are negligible and because of the long life, the annual cost is low. Can be interchanged with present batteries—guaranteed starts. Quick sure breakaway—no buckling of plates—immune to excessive discharges and short circuits—safe starting at extreme low and high temperatures—steel construction withstands shock and vibration—you must investigate—there is a difference.

Nickel Cadmium Battery

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NIFE INCORPORATED

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news of our industry

Parachuting Big Bulldozers

Hundreds of tons of bulldozers and other heavy machines can now be parachuted into an airhead, and airstrips constructed in a matter of hours, as a result of the Corps of Engineers' development of a new family of welterweight airborne construction equipment.

Back in World War II days, this wasn't so. The airborne construction capability was strictly limited by the 8000-lb glider payload. Only midget 2-cu yd earth scrapers and other too-small machines for effective military operations could be airborne.

Then in 1947 the C123 was designated as the assault plane. Even its weight limitation of 16,000 lb seemed insurmountable. The Corps of Engineers put their heads together with construction machine experts. They came up with a family of modified standard machines—with poundage cut but not work capability.

Most impressive example of the program's success is the airborne crawler tractor bulldozer—high on horsepower but with half the weight of the usual 33,000-lb dozer. Power was substituted for weight wherever possible. Ten pounds were saved here, a hundred there. Weight-saving included use of frame and gas tank from a smaller machine, the track system of a middle-sized tractor, and a new hydraulically-operated dozer blade—lighter but more efficient than a mechanically-operated blade.

(*Continued on Next Page*)

GRIND CRANKSHAFTS IN THE BLOCK!
The Winona Lathebloc Crankshaft Grinder has given fast, accurate service in the Automotive field for over 18 years. Now it's available to the Diesel field. With a new large hook, the standard grinder will now grind shafts up to 3½" in diameter in the block!
WRITE FOR DESCRIPTIVE LITERATURE AND PRICES.
WINONA TOOL MFG. CO.
WINONA, MINN. U.S.A.

(Continued from Previous Page)

Every component was studied with an eye to lightening the weight and still doing the job. A solid part was replaced with lighter webbed casting, grousers were reduced in size and brush guards were modified or removed. So adaptations progressed until gradually the magic goal of only 16,000 lb, weight limit of the plane, was met.

In initial tests, the productive capacity of the lighter machine was less than standard, since its lightweight dozerblade tended to ride up over hard earth. Then a new idea beginning to gain favor commercially was tried—using reversed scarifier teeth on the bottom of the blade. During backup of the tractor, the blade was left low, and the teeth scarified the next cut which was to be dozed out. In effect, the whole horsepower of the tractor was utilized during the complete cycle. With the earth so torn up, excavating became practically a backfilling operation, making possible a much higher forward speed.

Net result, the Army today has a 15,860-lb airborne tractor dozer nearly equalling performance of a standard tractor by increased speed through greater horsepower. In fact, it has a whole family of such low-in-weight, high-in-workload construction units. Crushers, graders, tandem rollers, saws, cranes, air compressors, scrapers, loaders and tractors—all now can be airborne and air-dropped. They even parachute a mobile maintenance shop complete with mechanics tools, welding and cutting equipment. Yes, the Corps of Engineers and his equipment go airborne these days.

10 little Mufflers all in a row

...and they're all Kittell's!

In areas where little or no exhaust noise can be tolerated, use Kittell residential-type silencers—like the ten horizontally-mounted KR's shown above. The unique features of Kittell silencers and spark arrestors are the result of more than 15 years of silencer design and fabrication experience. Models are available for almost all industrial, mobile and marine applications. Excellent delivery on both standard models and specials. When local dealers do not have the desired size in stock, shipment is made from the factory in from one to four days. Special engineering also available when required.

Kittell

Write for new 1957 catalog just off the press.

Kittell Muffler & Engineering, Inc.

915 SOUTH SANTA FE AVENUE, LOS ANGELES 21, CALIFORNIA

REBORE CONNECTING RODS IN YOUR OWN SHOP

New GREENLEE

HYDRO-BORER

Assures precise alignment.
Accurate to .0003" T.I.R.
Fast precision boring.

Quick, easy setups.
For any size rods.
A money-maker in every engine shop.

WRITE FOR COMPLETE INFORMATION

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FREE to Every Shop Operator

BACHARACH
DIESEL SHOP MANUAL
FOR
AUTOMOTIVE DIESEL ENGINES
BULLETIN AD54

76 Pages—275 Illustrations
56 Engine Reference Tables
26 Parts Lists

- Diesel Compression Testers
- Nozzle Testers for American Bosch, Caterpillar and Bendix Nozzles
- Cummins Injector Tester
- International Harvester Injection Testers
- General Motors Injector Testers
- Injection Pump Calibrating Stands
- Nozzle-Injector Cleaning Tools and Lapping Blocks
- Engine Overhaul Stands
- Engine Removal and Parts Dollies
- GM 71 Engine Tools

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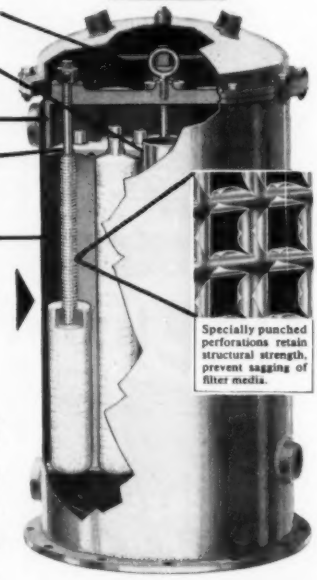
THE PROBLEM: **"Heavy duty filtration to your specification"**

THE ANSWER **"ENGINE LIFE *Maxiflo* '4000' SERIES OF FULLY ENCASED, MULTIPLE FILTER SYSTEMS!"**

Replaceable Element Filtration For Marine, Diesel and Natural Gas Engines In:

HEAVY INDUSTRY (Pipelines & Power Plants)
CONSTRUCTION (Heavy Earth-Moving Equipment)
MARINE ENGINES
STATIONARY ENGINES

"4000" SERIES



- Elements uniformly compressed with wing-nut bolts. This reduces service cost factor.
- Neoprene "O" Ring Seal insures perfect seal, eliminates gasket replacement.
- Cast aluminum manifold for ideal element compression.
- Piston type bypass valves do not orifice when open, valves face downward so abrasives will not adhere to piston and be flushed back into engine.
- Heavy welded steel construction.

Maxiflo non-corrosive metal cores handle up to ten times normal running volume, give solid vertical support.

MODERN FUEL CONDITIONING THROUGH "4000" FULL FLOW SYSTEMS

- Condition viscous lube oil and fuel.
- Remove, neutralize acid without using chemicals.
- Trap abrasives: carbon, dust, metal particles.
- Meet today's supercharged engine requirements.
- Give maximum oil flow, minimum pressure loss.
- Repel moisture on element surface.

Maxiflo "3000" SERIES *Ratio-rated for:*
OIL DRILLING RIG ENGINES • PUMPING ENGINES • TRUCKS • MARINE ENGINES (light) • CONSTRUCTION (Euclid trucks, shovels, etc.)

For moderately heavy duty installations, the Maxiflo "3000" Series offer the same consistent performance as the "4000" Series.

FOR BOTH *Maxiflo* "4000" AND "3000" COMPLETE DIMENSION DRAWINGS AND SPECIFICATIONS FURNISHED ON REQUEST

A Comprehensive Line of Filters and Replacement Elements

ENGINE LIFE PRODUCTS CORPORATION
EL MONTE, CALIFORNIA

news of our industry

Detroit Diesel Keeps Fast Pace

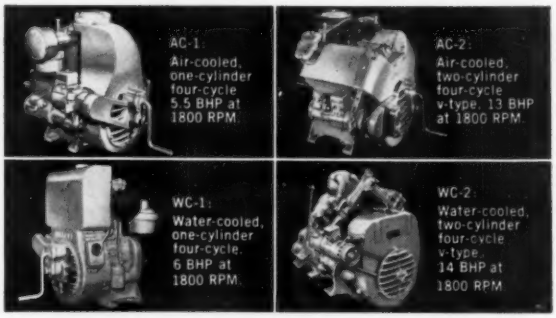
Solid rock at the rate of 4000 cu ft per 24 hr is being drilled, blasted and moved at Brownlee Dam. The Bucyrus Erie 71B shovel, pictured here, and three drills driven by an Ingersoll-Rand 900 Gyro-Flo air compressor are powered by "6-110" Detroit Diesel engines. The project being excavated by Morrison-Knudsen for the Idaho Power Company's dam involves 3½ million cu yd.

Oil Transport Trucks

Eight Kenworth Model 925 trucks, powered with Cummings NT-6-B 250-hp turbocharged diesels, are now in service at Oilfields Trucking Co. Their fleet now numbers some 100 units of hot oil equipment travelling an average of 2,500,000 miles a year transporting all types of petroleum products in California, Arizona and Nevada.

THE BIG 4 IN DIESEL POWER

AMERICAN MARC and Hallett combine their resources to bring you the finest small Diesels made to fit every job. Write today for full details and specifications.


AC-1: Air-cooled, one-cylinder four-cycle 5.5 BHP at 1800 RPM.
AC-2: Air-cooled, two-cylinder four-cycle v-type, 13 BHP at 1800 RPM.
WC-1: Water-cooled, one-cylinder four-cycle, 6 BHP at 1800 RPM.
WC-2: Water-cooled, two-cylinder four-cycle v-type, 14 BHP at 1800 RPM

AMERICAN MARC also manufactures Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 4 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit every job requiring from 5 to 20 BHP.

SOME DESIRABLE SALES TERRITORIES ARE STILL OPEN. INQUIRIES ARE INVITED FROM REPRESENTATIVE DEALERS.

AMERICAN MARC INC.
DIESEL ENGINES
1601 West Florence Ave. Box 549, Inglewood, Calif.
Telephone OR 8-7174
AMERICA'S LARGEST MANUFACTURER OF AIR-COOLED DIESELS

GE Locomotive Training

Lectures and factory tours will highlight the next training sessions to be held the week of May 6 at General Electric Locomotive and Car Equipment Dept. The course will cover the operation and maintenance of standard 25, 35, 45, 65 and 80-ton diesel-electric locomotives equipped with Cummins diesels.

What About Your Records?

University of California's second Construction Conference produced many good ideas. One in particular is of extreme importance to contractors in today's tight competitive bidding. W. A. Abrahamson, Morrison-Knudson district engineer, cited a recent survey showing that out of every 50 contractors only five were keeping accurate records reflecting the cost of owning and operating their heavy equipment.

It's a good deal like a banker not keeping any books. How do you know where you stand or where you're going? How can you judge the efficiency of your equipment—or the effectiveness of your maintenance program—or, for that matter, estimate your unit costs for bidding? Equipment is your capital investment; keep good track of it.

Railroad Meeting

The first Conference sponsored by the Railroad Division, ASME, was held in Chicago on April 25-26. To reach the maximum number of men, more such divisional meetings are planned.

This one included presentation of 11 technical papers, three informal talks and a showing of a color film, "What Is a Mechanical Engineer?"

Among other important topics covered were papers on: "Use of Catalytic Cracked Fuels in Diesel Locomotives", "Use of Economy Diesel Fuel", "Use of Economy Fuels on Diesel Locomotives", "Special Test Equipment on Railroads", and "Test Equipment for Use in Diesel Maintenance".

The Railroad Div. Committee is to be congratulated on the excellence of this initial Conference. Concentration on a specific phase of interest, as exemplified by this divisional program, will contribute greatly to the industry's progress.

Brazil Buys Diesel-Electrics

Almost one million dollars worth of diesel-electric locomotives have been ordered by Brazil from General Electric. Due for delivery in about six months, these six narrow gage units will be the first diesel-electrics on the route which connects Leopoldina with Penha and Duque de Caxias.

The locomotives, model U12C's, will have 1200 hp available for traction, with road-switcher type cabs.

Robertshaw Research Center

Construction is under way at Anaheim, Cal. of a $250,000 Western Research Center for Robertshaw-Fulton Controls Co., it was announced by Mr. T. T. Arden, executive vice president.

The new center, with 15,000 sq ft of floor space, will carry on basic and applied research in automatic controls for industry. The present research facility in Los Angeles will be merged with the new center when construction is completed.

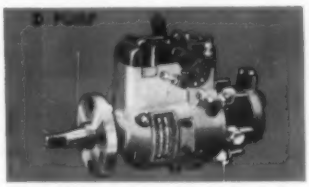
(*Continued on Page* 118)

why are contractors enthusiastic about . . .

ROOSA MASTER

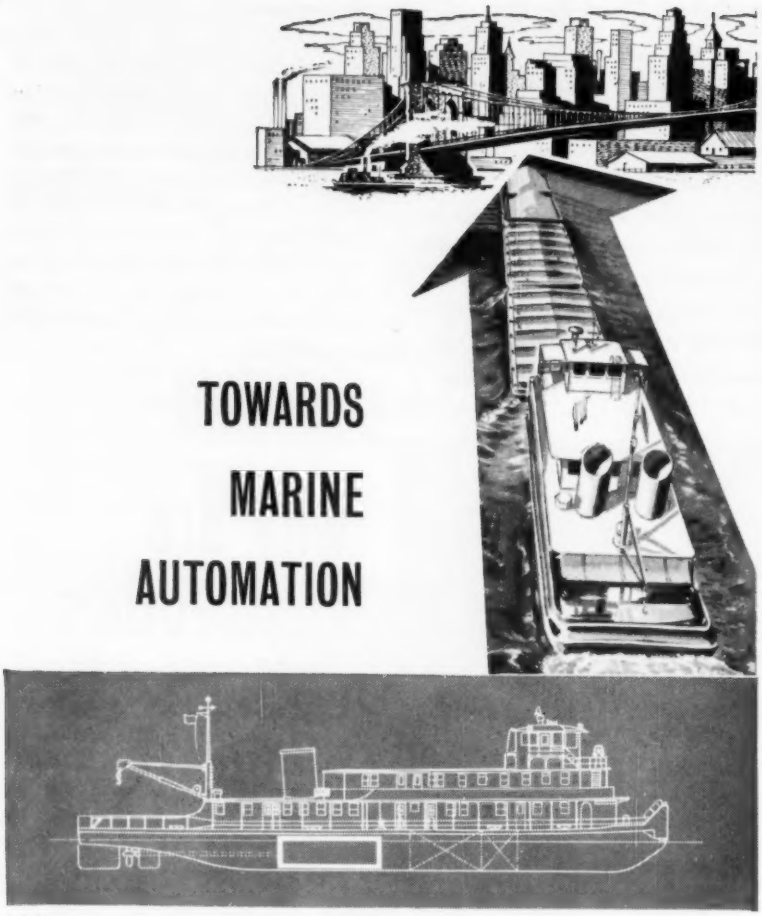
The answer is simple. Here is one, expressed by a satisfied user, Tully & DiNapoli Inc., New York General Contractors:
"We have completed our fourth year with the ROOSA MASTER fuel pump on our Truck #157. We installed this pump on an HB-150 horsepower Cummins engine in November 1952. Six months later we converted this engine to an HR-165 horsepower and two years later we overhauled the engine. No repair work was done on the pump during that time other than a change of calibration.
Now we have ROOSA MASTER pumps on other engines. We are very enthusiastic about the performance and economy of the fuel pump and are continuing to change over our entire fleet."

The lighter, smaller, ROOSA MASTER modern fuel injection pump makes good diesels better and makes users both satisfied and enthusiastic. For more complete information contact your engine manufacturer or write . . .



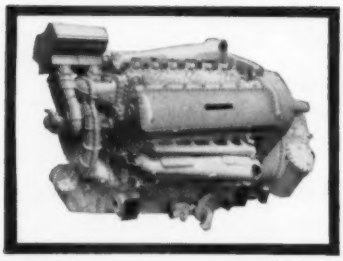
HMS ROOSA MASTER

HARTFORD MACHINE SCREW COMPANY
DIVISION OF STANDARD SCREW COMPANY
HARTFORD 2, CONNECTICUT



J. I. T.

The locked engine room—dream of every towboat operator, builder and engineer—is brought nearer to reality by the use of Napier Deltic engines. On Deltic-powered towboats you can have complete, instrumented Pilot and Engineer's Remote Control Stations—a big step towards marine automation. There are other equally important reasons for using Deltics. They reduce vessel layup and increase earning capability. When a major overhaul is needed the low weight and compactness of the Deltic permit engine replacement in a few hours. Deltics (825—2,500 s.h.p.) have the best marine Diesel power/weight ratio in the world. Get in touch now with Napier's representative. He'll tell you more about the advantages of using Deltic Diesels.



NAPIER Deltic marine diesel

A NEW CONCEPTION OF MARINE POWER

Representative: L. O. Brooks, Dupont Circle Building, 1346 Connecticut Ave. N.W., Washington 6 D.C. Phone: North 7-0146

D. NAPIER AND SON LIMITED · LONDON · W.3. · ENGLAND
Partners in Progress with The ENGLISH ELECTRIC Company Limited

CRC D23

Service Section

(*Continued from Page* 80)

Cat 24-v Starting System

(Continued)

Also, if gassing is noted at the end of the day's run the battery is probably being overcharged. In either instance, the voltage regulator should be checked, adjusted or replaced

If the voltage regulator is removed from the machine to be checked, also check the generator. In cases where a fully charged battery cannot be maintained, it is frequently the generator that is at fault and, therefore, both the regulator and generator should be checked.

Before condemning the voltage regulator, battery, generator or any part of the electrical system, make certain that all electrical connections are tight and that a cable isn't frayed causing a short circuit or discharge of current.

Also, before having voltage regulator serviced, inspect the resistors on the back of it. If any of these are broken, the regulator must be replaced at once. Failure to do so can seriously damage the battery and the generator.

Regulator resistors will burn out if the "A" and "F" terminals are accidentally connected at the regulator or generator. Therefore, when working around the regulator or generator, tape or otherwise insulate these terminals if they are not protected with a rubber nipple.

GM Engine Filter Replacement

(Continued)

When servicing the former 8-in assembly, the correct element to use is Part No. 5573264 (TP 512) which includes the flat type gasket. When servicing the new type assembly, the correct element to use is Part No. 5573262 (TP 510) which includes the reusable gasket.

Filter element, Part No. 5573264 (TP 512) can be used in the former filter assembly and in the new filter assembly; whereas, Part No. 5573262 (TP 510) can be used only in the new type assembly. When using Part No. 5573264 (TP 512) in the new type assembly, gasket, Part No. 5574161, must be used in place of the flat gasket.

Service Section

(*Continued from Page 80*)

I-H Revision of Exhaust Valve

The exhaust valve (slo-roto type) 126 558 R2 used on the U-372, U-450 and U-501 Power Units, has been revised in that the valve has a heavier underhead section to improve the life of the valve. The new valve part number is 126 558 R3.

Exhaust valve rocker arm assembly 58 446 HDY must be used with 126 558 R3 exhaust valve on the U-372, U-450 and U-501 engines.

The new exhaust valves are to be used on the Mod. U-372, Nos. 53 601, 53 863, 54 272, 54 480, 54 682 and up; on Mod. U-450-No. 54 759 and up; and on Mod. U-501, No. 55 024 and up.

Exhaust valve 126 558 R3 must be furnished for engines equipped with natural gas or liquified petroleum gas.

Lube Oil For Cummins Engines

(*Continued*)

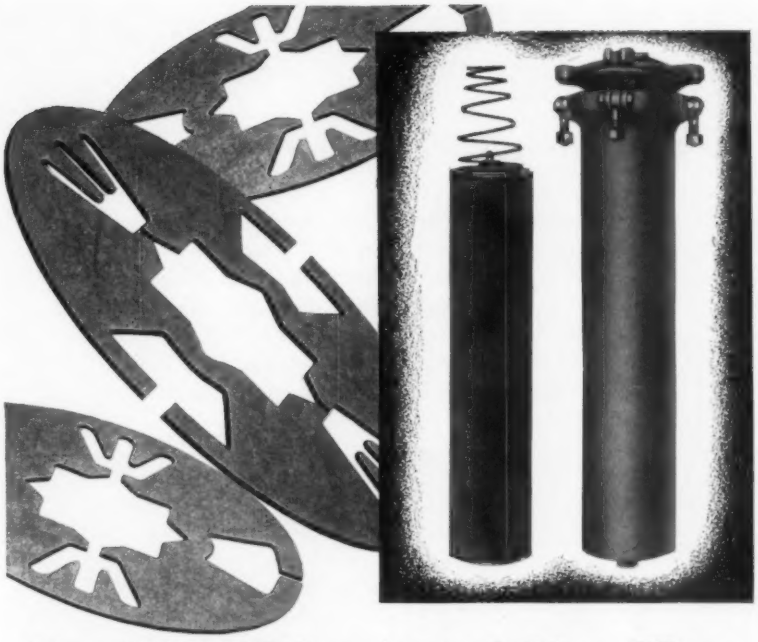
ance level for Mil-L-2104A specifications. Those brands are listed in the booklet as Type A oils. In the same booklet Type B and Type C oils are listed as those which meet more severe lubrication requirements.

Type A oils are satisfactory for normal service in Cummins engines, but under adverse conditions of low temperature, frequent starting and stopping, or high-sulphur content fuel it may be advisable to use Series 1 or "Type B" oil. Contact your oil supplier for his recommendations.

Viscosity of lubricating oil used in crankcase should be as follows: SAE No. 20 when ambient temperature is below 32°F. SAE No. 30 when ambient temperature is above 32°F.

No change in oil viscosity or type is needed for new or newly rebuilt engines. Oil which is best for general operation is also best for the "break-in".

Lubricating oil and oil containers must always be kept free of foreign matter if we are to expect good service from the engine. Most engine failures are due to dirt, in some form or other, being introduced into the engine.



the NUGENT Laminated Disc Filter

This "extended area" filter utilizes an actual filtering surface area greatly in excess of its container area. The Nugent Laminated Disc Filter provides a high flow rate at low pressure drop combined with the extreme fine filtering absorption and neutralizing properties of a depth type filter.

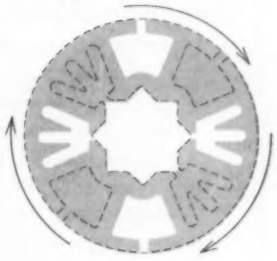
The filter charge consists of a stack of similar crenulated fiber discs, each rotated 45° from the position of the adjacent disc, thus affording proper channeling and maximum filtering capacity. Liquid passes from the exterior to the interior of the filter stack.

The filter recharge has a useful life of from 4 to 10 times that of a cellulose or waste recharge. Changing recharges requires only minutes. Cartridges are interchangeable with all other Nugent bag or depth type cartridges. Write for full details.

DESIGN FEATURES

- Provides "Extended Area" filtering
- Removes solids as small as 2 microns
- Removes acid forming contaminants
- Will not remove additives
- Contains no chemicals or bleaches
- Working pressure 125 psi—tested to 375 psi
- High pressure filters to 600 psi—tested to 3000 psi
- Built in by-pass relief
- Maximum operating temperature 375°F.

HOW IT WORKS



Each disc in filter stack is rotated 45° from position of adjacent disc for proper channeling and maximum filtering capacity.

Established 1897

Wm. W. Nugent & Co., Inc.

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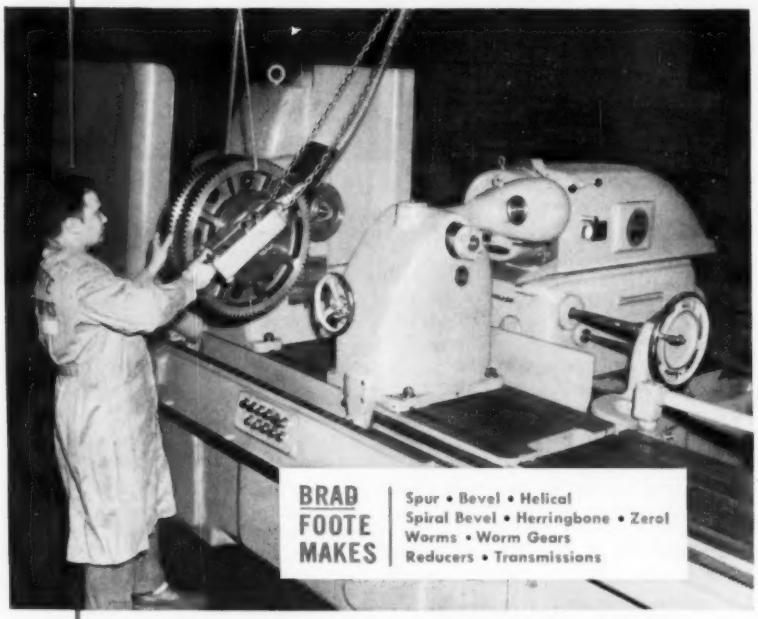
SPECIAL MACHINES —MEN

2 Reasons Behind Brad Foote Quality

• The craftsman shown below is loading a gear into one of the latest additions to BRAD FOOTE'S long list of special-purpose machines. The only one of its kind in existence, this new shaver can straight or crown shave gears up to 51" in diameter. Normally accommodating gears with shafts up to 142" between centers, it can handle even longer shafts by using special journals. Specially designed, the new machine will shave either internal or external gears.



• Costly special machines such as this are important in providing the extra quality at lowest cost which is the hallmark of BRAD FOOTE gears. But these are only part of the story. Even more important, perhaps, are the men who man these machines—experienced craftsmen with long experience in producing gears to meet the most exacting and specialized requirements.

• BRAD FOOTE'S facilities are at your disposal whether you need one gear or a long production run. We would sincerely appreciate an opportunity to discuss your requirements or quote on your specifications. Your inquiry will receive prompt attention.

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Bishop 2-1070 ● Olympic 2-7700 ● TWX: CIC-2856-U

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Phone: Lemont 920
Lemont, Illinois

PITTSBURGH GEAR COMPANY
Phone: SPalding 1-4600
Pittsburgh 25, Pennsylvania

new products

(*Continued from Page* 95)

Water-Cooled Manifold

Cat D375 and D397 Turbocharged engines can now be equipped with water cooled exhaust manifolding. In certain installations, especially marine, these manifolds serve two purposes: they reduce engine room temperature and reduce fire hazard.

Boring Head

Kennametal has developed a boring head for boring engine cylinders or liners that utilizes four ½-in. square "turn-over" button inserts which have eight indexable cutting edges per insert. Shims assure positive seating. Special heads can be built to specification.

Bearing Monitor

A multi-point bearing monitor, providing centralized and automatic temperature protection for bearings in large stationary machinery installations, is announced by Tipp-Tronic, inc. The controller is especially suitable for use with such installations as diesel engines, stand-by electric generators, water pumping systems, petroleum pipeline pumping equipment, coal slurry pumps, or wherever the cost of replacing burned-out bearings is usually much greater than the cost of equipment for controlling bearing temperatures.

Explosion-Proof Floor Machine

Holt Mfg. Co. announces an improved, explosion-proof, all-purpose floor machine. The explosion-proof feature is important for house keeping jobs in potentially hazardous areas such as gas pipe line pumping stations, etc.

By mounting the electric switch on motor housing, wiring from motor to handle was eliminated. Entire unit is built, safety-tested and sealed to prevent sparks and static that might ignite gas, dust, fumes or vapors. Installation of static eliminator wire prevents shock to operator. The use of dual handles spreads the load and reduces the effects of torque, giving the operator better control, thus reducing fatigue.

new products

Moly-Disulfide Lube

Molyglyde, a newcomer to the lubrication field, is a molybdenum disulfide base lube introduced by VanGuarD Lubricants Inc. Working on the "dry" lubrication principle, a variety of lubricants are available for such diversified applications as "fifth wheel" to food processing.

Cell Filler For Industrial Batteries

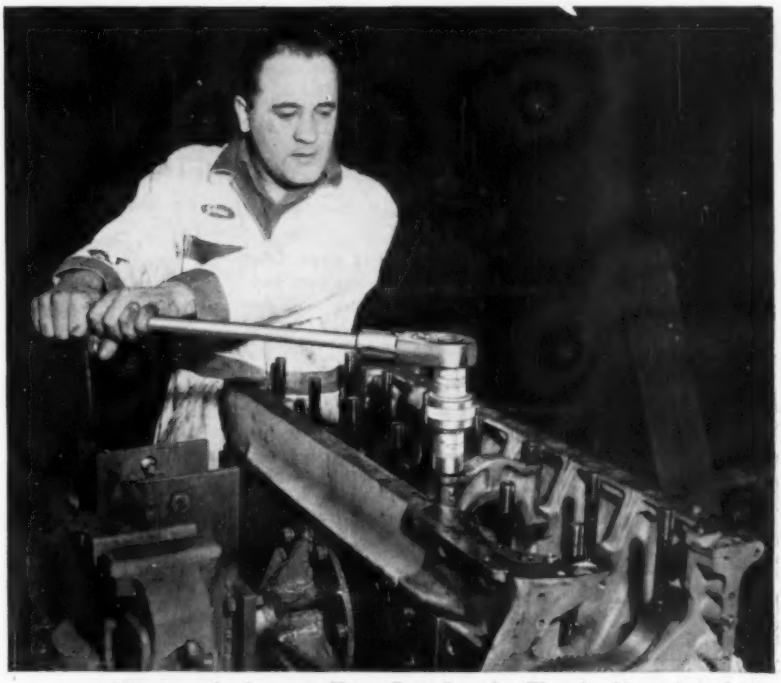
A battery cell filler that was developed for railway service is now being offered to industrial plants by Gould-National Batteries.

Called the "Rite-Hite" cell filler, it controls the electrolyte level in batteries by adding water to the correct height without overflushing. Connected to a water supply of 20- to 50-psi, the filler consists of a long tube to allow reaching across large batteries and a hydrostatic means of controlling flow. According to the manufacturer, maintenance of the Rite-Hite is simple as it has few moving parts. As the nozzle of the filler is removable and threaded into a coupling on the tube, the filler can be adapted quickly to filling all types of batteries.

Diesel Trouble Spotter

"Dieselspotter", a pocket-sized slide rule-type analyzer, is a convenient guide for pinpointing diesel engine operating troubles. Three major indices of engine functioning—firing pressure, compression pressure, and exhaust temperature—are each represented by a slide. Set the three slides in accordance with the conditions found and the setting produces a code number. This number is easily located in the companion guide booklet which gives easy-to-understand explanation of the trouble and its correction.

The trouble-spotting device was prepared by Dr. P. H. Schweitzer, prominent in the field of internal combustion engines. It is currently available from Dieselspotter, 540 E. Broad St., Westfield, N. J.



Here a mechanic uses a Heavy Duty Loxocket Wrench with ratchet adaptor to tighten down a bearing cap on a diesel engine. In this shop, all caps are first assembled without drive shaft and bearings so that bore alignment can be tested with a special cylindrical checking bar.

*Snap-on Tools

grip safe — grip sure

A man can lean into this Extra Heavy Duty Loxocket® Wrench — and do it with confidence. It has the strength and heft to handle the big, nut-turning jobs — quickly, surely, easily.

Sockets are hot-broached providing smooth walls and corners that are free from tears and cracks. They're heat-treated all the way through for toughness on the inside as well as the outside. These, and many other developments, give *Snap-on* tools that extra measure of strength, long life and smooth fit. They'll cut your tool costs — and your downtime.

If you have a problem involving special tool design or application or any other question on tools, talk it over with your *Snap-on* man. Write us or call your nearest *Snap-on* branch. Free catalog of mechanic's hand tools is yours for the asking.

*Snap-on is the trademark of Snap-on Tools Corporation.

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HERE is a big 8½" x 11", file size, 16 page, fully illustrated booklet. It's brimful of technical data and drawings that every designer and operating engineer will want to read or keep for ready reference. Write for your copy. No obligation.

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PACKAGED GENERATOR CONTROL UNITS

FOR A.C. GENERATORS TO 200 KVA . . .
DEPENDING ON EXCITER CHARACTERISTICS

These control units incorporate the basic meters and control components necessary for the operation of gasoline and diesel engine driven generators.

Extra meters and controls can be added to the basic units as required by the job.

These controls are extremely flexible and can be adapted to a large range of generator sizes.

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1139 NORTH MacARTHUR BOULEVARD • SPRINGFIELD, ILLINOIS

organizational news

(*Continued from Page 99*)

Lars C. Prestrud

Colorado Kenworth News

Kenworth Motor Truck Co. has announced the naming of Lars O. Prestrud as vice president and general manager of Colorado Kenworth Corp. Since 1933, Mr. Prestrud has concentrated on the sale of trucks and diesel engines in that state.

Borg-Warner Buys Australian Plant

Latest move of Borg-Warner Corp. in expanding its foreign manufacturing facilities, is the purchase of Coote & Jorgensen, Ltd. G. V. Patrick has been named managing director of the plant. Coote & Jorgensen are suppliers to Australian companies of International Harvester, Ford, Caterpillar, Chrysler, Holden and British Motor Car Corp.

D. H. Briggs

Changes at Detroit Diesel

D. H. Briggs is now service manager of GM's Detroit Diesel Engine Div. Mr. Briggs was one of the original Detroit Diesel employees when the Division was formed in 1937. B. W. Patrick fills the place vacated by Mr. Briggs as assistant service mgr.

J. T. Hanna switches to zone mgr. of the Chicago area and S. C. Partel steps into post of Washington, D. C. sales representative while D. W. Radebaugh takes over as New York sales manager.

organizational news

E. J. van Dyk

Sterling Engine Moves

E. J. van Dyk, formerly with Detroit Diesel, has been appointed sales manager of Sterling Engine Co. at the newly established sales headquarters in Detroit. Sterling sometime ago moved its manufacturing facilities from Buffalo to Menominee, Mich.

Nordberg Man to Gov't Post

Carl O. Friend takes over as Director of Power Equipment Div., Business & Defense Services Administration. Mr. Friend is on loan from his post as administrative manager of Nordberg Heavy Machinery Div., and will serve the Government for six months under the current rotation system. His background qualifies him to ably carry out the Department's programs for current defense production and long-range industrial preparedness, and will serve to cement government-industry relations.

H. J. Kinkade

Heads New Perfex Division

H. J. Kinkade has been selected to manage the Perfex-Pak Division of Perfex Corp. This new Division will manufacture and distribute air cooled heat exchangers for industrial uses. Mr. Kinkade comes to Perfex with 32 years experience in the heat transfer field, including posts at Fairbanks-Morse and Young Radiator.

Three Step Up at Wilkening

Helmuth G. Braendel has moved up to v.p. in charge of engineering at Wilkening Manufacturing Co. John O. Lutz is named chief engineer while Henry O. Moffett takes over as factory manager of this piston ring plant.

New Chief Engineer

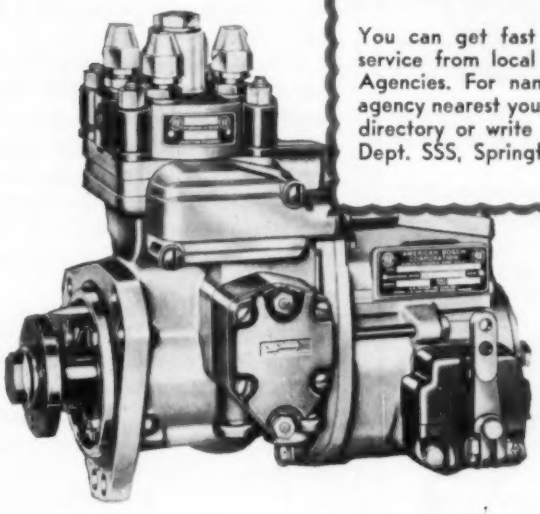
Charles Liechti has been appointed Chief Engineer, Technical Services, of the Eutectic Welding Alloys Corp.

Minneapolis-Moline's

new acquisition to the company is that of Wesley E. Schwieder who will be the new chief engineer of research and development of tractors and engines. Mr. Schwieder was formerly with Studebaker-Packard.

IIT Names Supervisor

C. Charles Miesse, a specialist in liquid propellant engines, has been named Supervisor of the newly-created Combustion Section at Armour Research Foundation at the Illinois Institute of Technology.



You can get fast and economical service from local American Bosch Agencies. For name of authorized agency nearest you, check your local directory or write American Bosch, Dept. SSS, Springfield, Mass.

the PSB fuel injection pump

UNEXCELLED

. . . for performance and outstanding service—that's the acknowledged record of more than 140,000 American Bosch PSB pumps now in use.

Here's some reasons why! Simple construction . . . fewer parts . . . accurate fuel metering and distribution . . . positive governor control . . . replaceable hydraulic head for fast field servicing.

What's more—all American Bosch fuel injection products are backed by a growing system of authorized service agencies, fully equipped to provide quick, efficient repair service.

Unequaled value—for top diesel engine performance and economy of operation . . . long trouble-free life . . . lower maintenance expense—nothing equals a PSB fuel injection pump.

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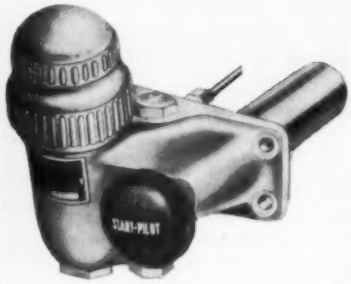
START PILOT

FOR INSTANTANEOUS DIESEL STARTING



STARTS YOUR ENGINE AT MINUS 60°F.
SAVES UP TO 50% ENGINE WEAR

DESIGNED FOR

ALL TYPES OF

DIESEL ENGINES

START PILOT CORP.
61 SECOND STREET
Mineola, N. Y.

Please send me additional information on the START PILOT device and the START PILOT fluid.

NAME .....

COMPANY .....

ADDRESS .....

new literature

(*Continued from Page* 103)

Sheppard Diesels

has published a 12-page pamphlet on their diesel engines for industrial and agricultural applications. Specs, dimensions and power curves are shown for 2-cyl Model 17A, 4-cyl No. 19 and 4-cyl No. 16 diesels. These engines deliver 20 bhp, 42 bhp and 78 bhp, respectively, at 2000 rpm.

Kellogg Air Compressors

Kellogg Div. of American Brake Shoe Company has published a 20-page catalog covering its line of 1/3 to 20-hp air compressors for automotive and industrial use. Well illustrated, the booklet gives complete specs on single and two-stage models, portable models, tanks, pumps and accessories. Useful charts, data and information on compressed air are also given.

Steel Tube Fittings

Weatherhead Co., Ft. Wayne Div., offers a 48-page catalog on steel tube fittings. It incorporates complete data on Weatherhead 7000 Series and 8000 Series Ermeto hydraulic flareless tube fittings and "Flare-Twin" S.A.E. 37 deg. Flare (J.I.C.) hydraulic tube fittings. In addition to complete engineering specifications, a section is devoted to assembly instructions, materials, finishes and operating pressures.

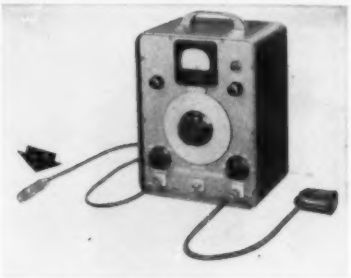
New Euclid Models

Three new Euclid scrapers and a new over-hung engine bottom-dump are detailed in literature by Euclid Div., G.M. Models SS-18 and SS-24 are 4-wheel tractor-type scrapers with struck capacities of 18 and 24 yd and 300-hp diesels with Allison Torqmatic drives.

Model S-12 bottom-dump is an overhung 218-hp diesel tractor with 13-cu yd semi-trailer. This unit has a Fuller transmission with 5 forward and one reverse gear selections.

Model TD-24, an over-hung engine type twin power scraper, has a 24 to 32-yd capacity. It is powered by two engines—300-hp with Allison Torqmatic drive for the tractor and 218-hp for the scraper axle.

NEW PRODUCT NEWS



Kistler Indicator Measures Engine Pressure Changes Quickly and Precisely

Featuring high sensitivity and extremely fast response, the new precision-made Kistler SLM Engine Pressure Indicator has been designed for research, engineering, testing and evaluating diesel, gasoline, gas, jet, rocket and atomic engines. It is rapidly being adopted by the automotive, aircraft, engine and fuel industries.

Pressure changes generating an electrical charge in the Swiss-made SLM Pressure Pickup are measured by an electrostatic type amplifier and displayed on an oscilloscope. Small pressure variations in overall cylinder diagrams can be magnified as much as a thousand times. Rugged enough to withstand diesel combustion and other temperatures up to 600° F, without special air or water cooling, the pickup will measure combustion pressures for all ranges, 0.1 through 3000 psi. With the addition of a Kistler adaptor, fuel injection pressures to 20,000 psi can be measured.

The ability of the SLM Indicator to measure directly either *pressure* or *rate* of pressure changes, makes it invaluable for fuel, combustion and detonation studies, load balancing, monitoring, peak pressure adjustment on production engines, and maintenance or repair operations. The most advanced engine analyzer available, it can be operated as readily as a TV set. Trouble shooting and ignition or injection timing are greatly simplified. Optional equipment includes a selector switch which permits operation of several pressure pickups with a single amplifier-calibrator unit, and a piston displacement indicator for direct display of traditional indicator diagrams.

For complete information on the SLM Pressure Indicator, including Swiss-made SLM Pickup, special low-noise cables and the Kistler "Piezo-Calibrator" (amplifier-calibrator), request Bulletin EPI-114.

Kistler Instrument Corp., Dept. PO, 15 Webster St., North Tonawanda, N.Y.

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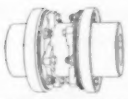
Specify

THOMAS

FLEXIBLE COUPLINGS

DOUBLE FLEXING
DBZ — for high speed, heavy duty drives

FLOATING SHAFT
BMR — for heavy duty service with excessive misalignment



DOUBLE FLEXING
AMR — for engine and medium speed drives

SINGLE FLEXING
SS — for engine-driven generator sets with out-board bearings

Thomas' 40 years of flexible coupling experience is at your disposal to help you meet ordinary applications or special variations for unusual cases.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51-A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U. S. A.

new literature

Revised Rockwell Catalog
on meters, regulators and valves is now available. The 28 pages feature, among many others, illustrations of a new remote control power pilot and an air-operating valve lubricant gun.

NEMEC Dual Fuel System
Advantages, operation and dimensions of the V-14 two-fuel system are detailed in a booklet published by NEMEC Combustion Engineers. A typical installation diagram and a comparison chart of residual and distillate dual fuel savings are included.

Keeping Oil Clean
In Bulletin OP-109, De Laval tells how to keep oil clean and dry, no matter what its use, with its direct motor-drive centrifugal oil purifiers. Tables are given on operating data, specifications and recommended purification capacities.

New GE Catalog Out
A 72-page book, GEC-1005H, on General Electric heaters includes complete data on short and long form heating calculations, as well as specs, applications and operating information on a wide line of heating devices.

Punch Locking Clamps
More than a compilation of its standard type hose clamps, the recently released Punch-Lok catalog serves as an instruction and training manual. Sections give details on Punch-Lok method, uses and applications and how to apply such clamps.

Films on Motor Upkeep
Two 20-minute, 35-mm colored sound slide films which show maintenance men how to install and properly maintain electric motors are now available from Allis-Chalmers for showing. The films, titled "How to Make a Motor Go-and Go, and Go, and Go", covering maintenance, and "How to Take Step Seven", dealing with correct installation, depict with cartoon characters and illustrations how motors can be kept in good operating condition.

SAVE MONEY ON DIESEL UPKEEP

free booklet tells how . . .

THIS illustrated booklet contains a wealth of sound, practical ideas to expedite Diesel maintenance, keep operating costs low and extend equipment life. Gives details on such subjects as:

- Cleaning filters
- Desludging lube oil coolers
- Descaling jacket water coolers
- Degreasing engine parts before repair
- Steam-detergent cleaning
- Plant maintenance cleaning

Booklet also discusses tested Oakite procedures for streamlining maintenance in steam control stations and electric power plants.

FREE copy of this 44-page booklet yours on request. Consult your local Oakite Technical Service Representative. Or write address below. No obligation.

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news of our industry

Mobile Power on Move Overseas

Mobile diesel electric power generation equipment of U. S. make is moving in ever greater quantities into overseas regions. Besides supplying power in disasters of war or nature, rail and highway mobile power units have proved invaluable in a rapidly expanding industrial program.

In just two years since GM announced its new mobile diesel electric power generation plant, General Motors Overseas Operations has shipped to one international utility company alone, twenty-nine 1000-kw railcar generators for power generation abroad.

Applications in particular demand are for "fringe area interim boosting" and "peak skimming"—meeting unusual demands for current, either so seasonal, temporary or so low in load factor, it's uneconomical to extend an original or second power line for protection. Connecting a mobile power unit into the power distribution system has supplied a long-sought answer to this problem.

Equally important use is for efficient repair and overhaul of widely scattered stationary power plants. Now they can rotate substitute power source among several plants for repairs without spending money for stationary standby power equipment.

There are two models in the GM Electro-Mobile Power Units line. One with 1000-kw capacity is for movement over railroad right-of-ways; the other with 500-kw capacity for movement over highways. In emergency or disaster when needs are greater, these units may be quickly connected in parallel to a common power transmission line for any desired multiple generating capacity.

As Henry B. Sargent, president of American & Foreign Power Co. and of EBASCO International Corp. states: "These portable diesel electric power generating units have been of great advantage in areas where you can't build lines fast enough or where the cost of a line to serve a peak load can't be justified. They have run at 80% load factor and have done a very good job.

They fill a very definite need in the growth and development of all utility companies."

These GM units can be automatically controlled by a central operator, hundreds of miles away, by impulses over a wire or by radio, or they can be started or stopped by fluctuations in voltage on the line which they are serving.

CAT Donates Diesel

Technology Diesel Department of Lamar State College is the pleased recipient of a D337 Caterpillar diesel engine. The engine was given so students at Lamar Tech can get more experience on the service and repair of Caterpillar engines.

Deeds like this, says Diesel Instructor B. L. McLendon, help assure the industry of technicians with training and experience on the latest equipment. This is a far-sighted policy. These students are the men who will be taking care of the equipment tomorrow.

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news of our industry

Euclid Plant Underway

Ground-breaking ceremonies March 27 in Hudson, Ohio, marked the beginning of construction on a new 650,000-sq ft manufacturing plant for Euclid Division of General Motors Corporation. Especially designed for the manufacture of crawler tractors for heavy construction and industrial use, the plant is expected to be in operation by July, 1958.

Three models of the Euclid earthmovers—the powerful TC-12 crawler-tractor, a 218 hp C-6 crawler, both of which will be built in the plant, and the new Twin-Power TS-24 scraper with a heaped capacity of 32 cu yd or 40 ton—will be used in the actual ground-breaking for the 500,000 cu yd excavation and filling jobs.

This crawler tractor plant represents just the first phase of extensive plans which call for additional manufacturing facilities, a complete parts warehousing operation, and general offices on the 430-acre site.

Good Bolt Tightening Practices

If strength of the joint is your only concern in an assembly, it's almost impossible to get the nut too tight, according to fastener specialists at Russell, Burdsall & Ward Bolt and Nut Company. If wrenching up doesn't break a bolt it will never break or wear out in service — presuming it's the right bolt for the job.

The tension left in a bolt after it's tightened opposes the external load applied in service and keeps the nut tight. So long as preload tension—clamping joint members together—is greater than external load, the bolt won't fail. Maximum pre-load tension means maximum resistance to external stress.

So you see, under-tightening may affect joint strength, but "over-tightening" never does. However, there are applications where too much tightening is bad:

1. When the man with the wrench gives all he's got in tightening up a joint, the bolt will probably stretch permanently, deforming the threads a little. This doesn't affect strength, but nut and bolt can't be reused. Therefore, where bolts are permanent fixtures, assemblers needn't worry about over tightening. Where fasteners may be removed in service, avoid tightening the bolt to the point where it is permanently stretched.

2. A steel bolt stretched in tightening no more than 0.001-in (0.002 for heat treated bolts) per inch of grip length —distance between bolt and nut—will return to normal without deformation of threads.

3. Where a soft-surfaced material, such as a gasket, is part of the joint, it's impossible to put much tension in the bolt. Tightening simply compresses the soft material. In this kind of joint, R B & W engineers recommend tightening the bolt just a little more than enough to hold the joint together under load.

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news of our industry

RR Motors for Oil Drilling

Traction motors and generators formerly used for railroad service are now available to drilling contractors to drive draw works and mud pumps in deep rotary drilling. The Westinghouse Electric Corp.'s rectifier and traction equipment dept., East Pittsburgh, Pa., has combined these traction motors and generators with the White-Superior Diesel Engine to produce a drilling unit said to give maximum horsepower in minimum space.

Enterprise Engines to Pump Union Oil's Oil 180 Miles

Union Oil Co.'s 16-in. pipeline connecting San Francisco Bay and the San Joaquin Valley, some 180 miles, will carry product pumped by nine Enterprise gas engines. The units will be located at either end of the long pipeline and two locations in between. The project will be completed sometime late this summer. All engines are Series G, six-and eight-cylinder models, normally aspirated and operating on natural gas.

McLean Expands

Carolina Motor Express Lines, Inc., Class I motor freight common carrier, has been taken over by McLean Trucking Co. This will, says Paul P. Davis, McLean president, become an increasingly vital link in transportation connecting as CMX does all of the Midwest with the entire Southeast.

Diesels Cost Far Less

Enough "reason-why" for using diesels is told in the 1956 figures just released by "Transport Economics," ICC, on comparative gross ton-miles per fuel expense dollar for four kinds of fuel used in road freight service by Class I railroads. Oil-fired steam locomotives scored a low 1957 gross ton-miles per fuel dollar. Next came electric locomotives with 2959; coal-fired steam units ranked third with 3087. Far ahead of all others were diesels with 5299.

Railroads will spend more for road and equipment "Transport Economics," ICC, also says. They will purchase $1,364 million in 1957 from estimates furnished by 111 Class 1 line-haul railroads. This projected figure is $175 million or a whopping 14.7% above actual '56 figures for the same roads.

Alco Builds 900-hp Switcher

In a major modification to fit a customer's needs, Alco Products, Inc. delivered a DL-430, 900-hp switching locomotive equipped with pneumatic-hydraulic control. Customarily Alco locomotives have electrical control. The new unit is powered by a 6-cyl, in-line Model 251-B diesel, developing 900-hp at 1000 rpm. This switcher is the first built by Alco capable of multiple operation with diesel locomotives of the same class.

The basic difference in the two control systems is that changes within the governor, when electrical control is used, are accomplished by solenoid valves, while with pneumatic-hydraulic control signals are transmitted with changes effected through air pressure.

The DL-430 will haul coal from mines to a by-product coke plant in Alabama.

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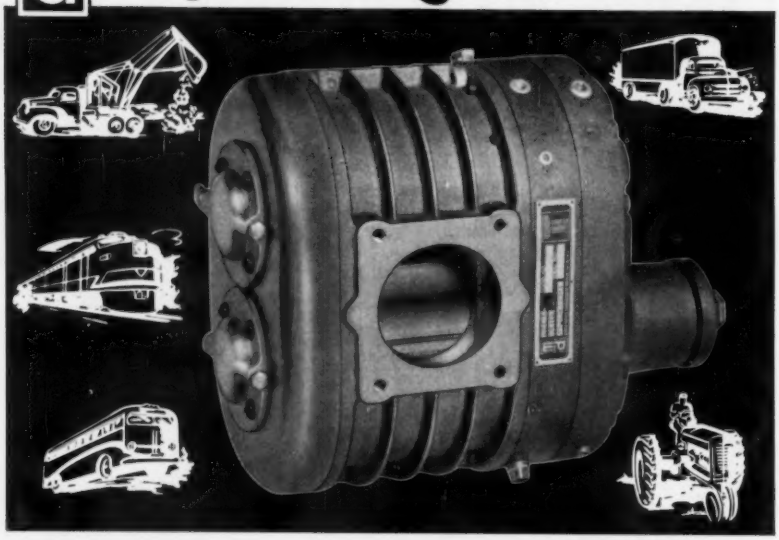

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news of our industry

P & H Dealer Show Hits Road

Harnischfeger Corp. Construction & Mining Division sales and service show has started its 18-city route. By next July, the show will return to the Milwaukee plant having traveled over 4000 miles.

At each stop P & H representatives will brief dealer organizations on the company's current sales program, business outlook and up-to-date service methods. This briefing is followed by an open house for prospects and customers to inspect displays, review developments and discuss their problems with dealer and P & H personnel.

Truck Tonnage Up

Volume of intercity general freight transported by truck during January, 1957 was up 3.7% over that hauled during January, 1956 and 14.4% over volume hauled in December, 1956, reports the Research Dept. of the American Trucking Association.

Unadjusted figures are based on the Department's monthly survey of Class I and II intercity common carriers of general freight, previously designated as Class I.

A Class I motor carrier is now designated by the ICC as one grossing $1,000,000 or more annually. Class II carriers are those grossing between $200,000 and $1,000,000.

Recent Fairbanks Sales

Fairbanks, Morse & Co. racked up a highly respectable number of engine sales over the past month to a widely distributed sampling of American industry. Largest of the 14 engines was a 10-cyl, 1600-hp, Model 38DD-⅛ dual-fuel engine sold to the Village of Waterville, Ohio. Next in line was one 6-cyl, 960-hp, Model 38D-⅛, single-rotation marine diesel bought by La-Crosse Dredging Corp., Chicago.

The remaining engines ranged in hp from a low of 5¼ to a high of 450 and were purchased by such varying interests as Sylvania Electric Co., New York and Emard Packing Co., Seattle.

American Equipment for Argentina Drill Rig

A powerful rig is being used by Yacimientos Petroliferos Fiscales for deep-drilling in heavily-forested areas in the Province of Salta in Argentina.

The rig is a National Type 130. It has a 3-section drive group powered by White-Superior PTDS 8-cyl, dual-fuel turbocharged engines through National torque converters. Each engine is rated 670 hp.

Two National Type E-700 slush pumps handle mud requirements. Each pump has 8½-in. liners, is rated 700 hp at 65 strokes per minute, and has a capacity of 955 gpm. The draw works is equipped with a 60-in. hydromatic brake, a Type "A" overrunning clutch, and a micromatic drilling control. A 140-ft derrick is used.

The rig is usually considered to be in the 10,000 to 16,000-ft depth range. Yacimientos Petroliferos Fiscales has drilled to 12,335 ft in 150 days.

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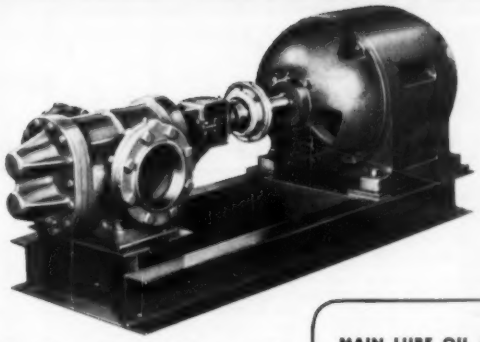

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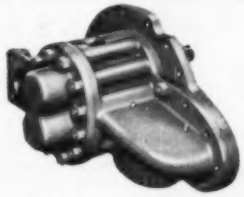

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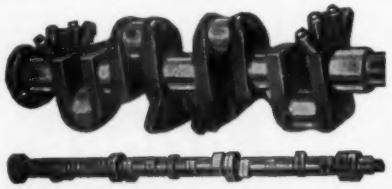

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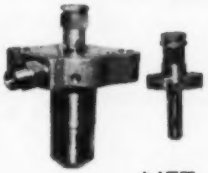

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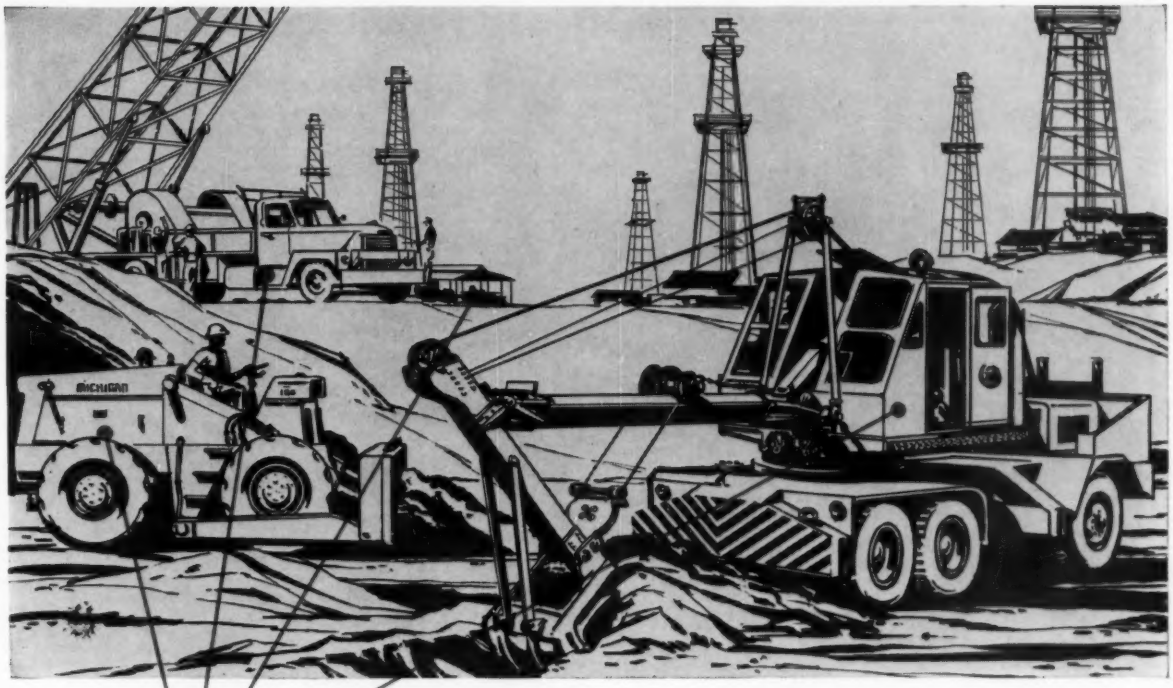

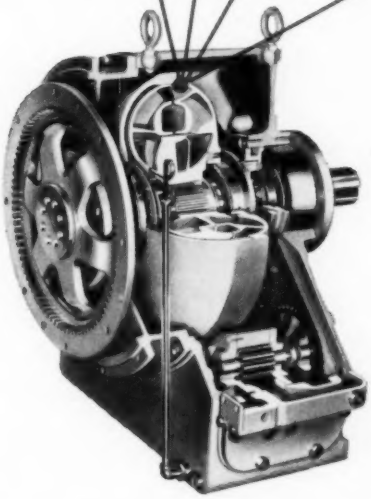

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They licked a problem— before it happened— with STANODIESEL Oil M

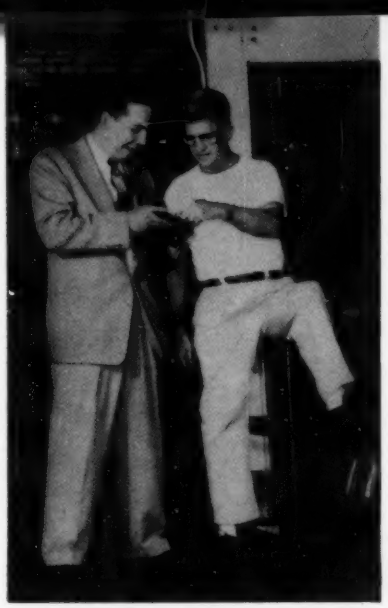
How Sturgis light plant planned ahead to eliminate source of possible power shut down

Sturgis, Michigan, light plant management in 1946 determined that it might be difficult to satisfy all power requirements if the light plant's large engine, or more than one of its small engines, was down. The plant is equipped with 5 engines—four GM 1,600 H.P. and one Busch-Sulzer 2,475 H.P. Plant management rightly figured that one of the keys to the problem was good lubrication. So, in 1946, STANODIESEL Oil M was tested in one General Motors engine.

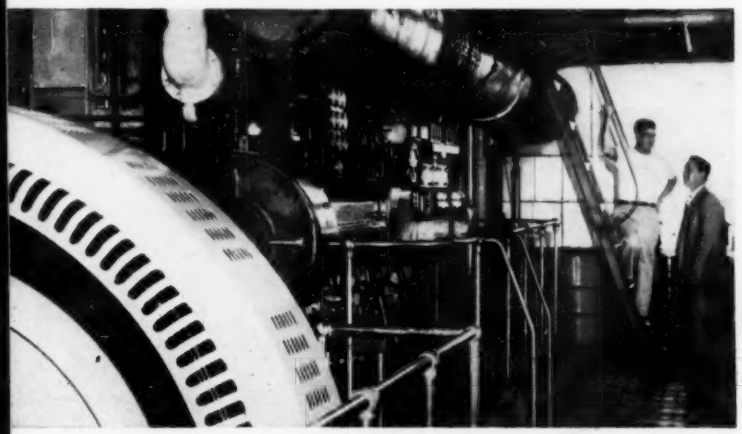
In 1947, based on its performance during the test, all engines were converted to STANODIESEL Oil M. In the nine years since, the plant has never had to shut down power to customers because of engine or oil failure. There have been no wear problems. Engines have stayed clean. There is no ring sticking. Bearing life is exceptional.

STANODIESEL Oil M can give this kind of performance for two big reasons: (1) its highest quality base stock, (2) its additive formula. STANODIESEL Oil M has superior stability. An oxidation inhibitor helps to prevent unwanted increases in oil viscosity. Detergent-dispersant additives keep crankcase, pistons, cylinder walls and other parts clean. An anti-foam agent controls foam.

There's a Standard Oil industrial lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Call him for more information about STANODIESEL Oil M. Or write Standard Oil Company, 910 S. Michigan Avenue, Chicago 80, Illinois.



J. J. Threlfall, superintendent and Donald Cripps, Standard Oil lubrication specialist check Don's data book on Sturgis light plant diesels. Don is well qualified as a lubrication specialist. He has been doing this work for nine years. He has an engineering degree from Michigan State University and is a graduate of the Standard Oil Sales Engineering School.



Sturgis, Michigan, light plant has four GM 1,600 H.P. engines and this Busch-Sulzer 2,475 H.P. engine. Engines receive progressive maintenance at 3,500 to 4,000 hours. STANODIESEL Oil M is used in all engines.

Quick facts about
STANODIESEL Oil M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by use of economy fuels.
- Maintains film on difficult to lubricate areas and parts.
- Eliminates spark plug fouling in spark ignited engines and reduces combustion chamber ash deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil commingle.

STANDARD OIL COMPANY
(Indiana)

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